Planning and Budgeting DoD's Weapons Systems

Defense AT&L interviews

Dr. Nancy Spruill

Director of Acquisition Resources and Analysis, Office of the Under Secretary of Defense for Acquisition, Technology and Logistics

ALSO

Doctor, It Hurts When I Do This...

Next-Generation Sensor Technology, Now

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The Importance of Litigation Management

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Report Documentation Page

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We will start programs right, execute programs properly, and improve program management and oversight.

How does DoD create a system to track its total net worth of equipment? What is the real cost of a heavily used F/A-18 versus a sparingly used one? How does DoD standardize acquisition data across the enterprise and ensure that information is shared with those who need it? These are just a few of the types of questions Dr. Nancy Spruill is answering in her position as director of acquisition resources and analysis in the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD[AT&L]). In June, she took the time to discuss several acquisition improvement initiatives with *Defense AT&L*: the recent changes implemented for the business, cost estimating, and financial management career field; developing better cost-growth tracking methodologies; and other topics.

Q

Can you give an overview of your responsibilities as director of acquisition resources and analysis in the OUSD(AT&L)?

A

As director for acquisition resources and analysis, I report directly to the under secretary of defense for acquisition, technology and logistics, Dr. Ashton B. Carter. I've held this position since February 2000.

The three most important jobs I do for the USD(AT&L) are: one, I am the executive secretary for the Defense Acquisition Board; two, I manage all aspects of the under secretary's interaction in the planning, programming, budgeting, and execution (PPBE) system; and three, I manage many of the important aspects of the OUSD(AT&L)'s interaction with Congress—such as rollout of the president's budget—in the investment areas, including funding of the major defense acquisition programs (MDAPs), funding for spending in science and technology, funding for logistics support, and funding for installations support and construction.

Q

You manage the acquisition workforce's participation in the PPBE system. Can you discuss how you are working across the acquisition workforce to ensure all operations are aligned with the PPBE system?

A

I see effective interaction between the PPBE system and the defense acquisition management process as essential. Unfortunately, the PPBE system is a calendar-driven process, while the defense acquisition management process is focused on events, phases, and milestones. This disconnect creates significant challenges. Nevertheless, I constantly strive to ensure the acquisition workforce is meeting the PPBE system requirements without impeding the advancement of our acquisition programs. Often, this requires significant hands-on effort and a willingness by all parties to give a little for the betterment of the Department of Defense. I try very hard to make sure the PPBE system supports the acqui-

sition process by fully funding MDAPs and the associated operating and support needs. Programs can't be executed effectively unless the program manager gets the resources he or she needs to do the job.

Q

Can you talk about the recent changes in the business, cost estimating, and financial management (BCEFM) career field and what spurred the need to restructure?

A

The new business career field has two distinct tracks to recognize differences that have existed since the beginning of the Defense Acquisition Workforce Improvement Act of 1990. Cost estimating and financial management really do involve different but related disciplines. When we did a review of the training pipeline, we discovered that the cost estimating folks were getting training on only about half of the key things they needed to learn. It was very clear that a one-size-fits-all approach to training was not good enough—and we needed to change that. I also felt strongly that we needed to enhance the professionalism of the community and acknowledge that we need our people to have a lot more seasoning and experience to achieve the various levels of certification. That's why we increased the experience needed for certification with all three levels.

Another issue we were trying to tackle was the identification of key leadership positions for the lead cost estimator in major program offices. There's a statutory requirement to identify those positions, and we needed a way to cleanly identify them as cost estimating positions rather than using a more general BCEFM label.

Q

Can you discuss the training changes that professionals in the newly created business career field can expect? What do those changes mean for people who are already certified?

A

Training for the financial management track within the career field should not see major changes. The implementation guidance I signed on April 1 doesn't impose an additional training requirement for people currently certified in the financial management part of the career field. [*The guidance is available at <https://acc.dau.mil/GetAttachment.aspx?id=277653&pname=file&aid=42718&lang=en-US>.*]

There is a training impact to those in the cost estimating part of the community. That was purposeful and intended to address shortcomings to current training and the need to provide more cost-focused training to professionals in the cost estimating discipline. We need people who know more about what they're doing and to have considerable specialized experience in this domain. The implementation guidance gives people a couple of years to satisfy the new requirements, so I think we're giving them enough time to

Director, Acquisition Resources & Analysis, OUSD(AT&L)

Dr. Nancy Spruill received her Bachelor of Science degree in mathematics in 1971. She earned her Master of Arts in mathematical statistics in 1975, followed by her doctorate in 1980.

From 1971 to 1983, she held a variety of positions with the Center for Naval Analyses, including technical staff analyst, professional staff analyst, and project director. Dr. Spruill served on the staff of the Office of the Secretary of Defense from 1983 to 1993. Initially, she was the senior planning, programming, and budget analyst in the Manpower, Reserve Affairs and Logistics Secretariat. Later, she served as the director for support and liaison for the Office of the Assistant Secretary of Defense for Force Management and Personnel. She then served as the senior operations research analyst in the Office of the Assistant Secretary of Defense for Program Analysis and Evaluation.

In 1993, she joined the staff of the Defense Mapping Agency, serving as the chief of programs and analysis division for the DMA comptroller. Subsequently, she served as acting deputy comptroller and was a member of the Reinvention Task Force for the vice president's National Performance Review.

In 1995, she was selected as the deputy director for acquisition resources for the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics. In 1999, she was appointed director, acquisition resources and analysis for the OUSD(AT&L). In this capacity, she is responsible for the coordination of all defense acquisition and technology planning, programming, and budgeting process activities, as well as funds control, congressional actions in the authorization and appropriations processes, and special analyses for the OUSD(AT&L). She also manages the studies program for the Office of the Secretary of Defense, and oversees the OUSD(AT&L)'s office automation system and manages its information system network.

Dr. Spruill has been a member of the Senior Executive Service since 1995. She is a certified acquisition professional and an active member of the American Statistical Association. Her many honors and awards include the Defense Medal for Exceptional Civilian Service, the Defense Medal for Meritorious Civilian Service, and the Hammer Award.

get caught up. Also, there is the fulfillment process that allows people to request, through their supervisory channels, equivalency for a course if they have sufficient justification for not taking the formal training from the Defense Acquisition University.

Q

A major part of improving the mechanisms for the management of DoD acquisition programs is developing new DoD-wide software-intensive systems and programs. Can you discuss the new acquisition systems being developed across DoD? How are you ensuring the security/privacy of such systems?

A

We are taking a wholly different approach to improving our acquisition management systems rather than just trying to impose yet another set of system tools and technologies. The real problem in our acquisition management systems is the lack of timeliness, consistency, and coherence in the data that drive those systems, and we are addressing those lacks directly.

Specifically, we are establishing formal governance for acquisition data that will regulate the definitions, technical standards, and authoritative source for the data elements used in acquisition decision making. You would be surprised how often we see different authoritative information associated with a program.

I talked earlier about working to ensure program managers get the funding they need from the PPBE process, but you'd be surprised how many different stories I've seen about funding or how much a program thinks it has. Nothing drives me crazier than arguing over what are supposed to be facts. So we are working very hard on separating data availability—which will be provided via a service-oriented architecture data bus—from the management tools that use the data. I see two major benefits from this:
- We'll be assured that data elements appearing in one business intelligence system are consistent with the same data displayed in another tool.
- We really facilitate the implementation of new data analysis and mining tools by having a reliable one-stop shop for acquisition data.

A final side benefit—but not inconsequential—is that data governance assures, for the first time, data presented to the under secretary have a clear, defined, and governed provenance.

Q

The Defense Acquisition Management Information Retrieval (DAMIR) System is a tool used to identify various data sources the acquisition community uses to manage MDAP and major automated information systems programs. Can you discuss how acquisition workforce members should integrate the tool into their activities? What are the benefits of using this tool?

> ## I see effective interaction between the PPBE system and the defense acquisition management process as essential.

A

Our vision is that DAMIR is the system of record for the programs and systems that it covers. It is, for example, how DoD fulfills its statutory reporting requirements to Congress for the selected acquisition reports on MDAPs. It also collects and provides routine information needed for oversight and visibility into program execution status. The system has more than 3,000 users in DoD, Congress, the Congressional Budget Office, the Government Accountability Office, and other agencies. So, in a very real sense, DAMIR is the public face of programs to the governmental community.

In view of that role, acquisition workforce personnel should have two relationships with DAMIR: firstly, assuring that DAMIR accurately portrays their respective programs; and secondly, using DAMIR as a source for data that may be used in shaping expectations for new programs as well as assessing the performance of their own programs. Let me give you an example of the latter use (and these numbers are from a real example). Suppose you were looking at starting a new program, and both government engineers and your prospective contractors assured you that development would only take 24 months. Ten or 20 minutes in DAMIR may tell you that DoD had done half a dozen roughly similar programs in the past 20 years, and none took less than 60 months to bring to a production milestone. Is that information relevant to shaping your expectations and plans for the new program? I believe it almost certainly is, even if it is not used to establish the initial plan. At least you know what sort of risks the program is running.

Q

You've done a lot of work on the controversy over cost growth in weapons systems. Can you discuss your work related to the Government Accountability Office's Assessments of Selected Weapon Programs *report and explain the $296 billion they describe as cost growth?*

A

Has there been cost growth? Yes; but the OUSD(AT&L) simply does not agree with the GAO's methodology or that the cost growth they cite says anything about the amount of cost growth in the acquisition process today. There are two major problems, in my view, with GAO's estimate of acquisition cost growth. The first is their view that acquisition cost growth is a DoD-wide crisis of today. In fact, cost growth is concentrated in a few programs out of a total of 96, the majority of which experienced their cost growth in the 1980s and 1990s. According to OUSD(AT&L) calculations, the top eight highest cost-growth programs account for 80 percent of the total cost growth, and six of the eight were initiated before 2000.

The second problem is GAO's view that any increase in program cost is bad. But they count increases in quantity or capability as cost growth. A great example is the DDG-51 program. In that program, we were originally going to buy 23 ships; the program currently is at 62 ships, and we are now planning to buy more. Surely this isn't cost growth, but $48 billion of the GAO's $296 billion was attributed to the DDG-51 program alone. In addition, some older acquisition programs had early problems but have since been set right, and they are important parts of today's weapons. Two examples that jump to mind are the V-22 and the C-17. Of the GAO's $296 billion, $39 billion was attributed to those two programs. Cost growth, by the GAO definition, simply measures the difference in the program's first estimate—which could be more than 20 years old—against the current estimate. It is neither a measure of program success nor of the health of today's acquisition process.

We have agreed to work with GAO to get more relevant measures of cost growth because, although $296 billion is too big, we can't yet claim the number should be $0. So there is room for improvement, and we need measures that are relevant so they can help us see if the new initiatives we have begun—such as those outlined in the December 2008 version of DoD 5000 policies—are showing success. DoD hopes GAO will use some of the more relevant measures in their next report so our dialogue can be on improving the acquisition process, not disagreeing with cost growth statistics.

Q

What is being done to help cost growth for those programs in which it is a real problem, or to make sure we don't have such growth in future programs?

A

We have found that funding and requirements stability and greater technology maturity drive successful programs. As a result, we are taking a three-pronged approach in the areas of acquisition workforce reform, tactical acquisition reform, and strategic acquisition reform. For acquisition workforce reform, we will add 20,000 people to the acquisition workforce between now and 2015; and we will better train them and reinvigorate and raise their certification standards. We will also develop tenure agreements with program managers.

For tactical acquisition reform, we will start programs right, execute programs properly, and improve program management and oversight. That includes ensuring configuration steering boards for all major programs, early milestone reviews, competitive prototyping, and increased technology readiness levels for new programs.

For strategic acquisition reform, we will align strategy, budget, and governance. That includes aligning investment priorities to strategic priorities; balancing existing and future investments to provide the right mix of capabilities at the right time; and establishing a fixed, stable investment budget

Q

Can you discuss the Office of the Secretary of Defense Studies and Federally Funded Research and Development Centers (FFRDC) programs? What are some of the benefits of having such a program? How can a DoD agency or organization apply for it?

> **A wonderful analysis on bad data is useless. We need to start looking at our data and valuing them as the important resource they are.**

A

DoD FFRDCs occupy a special place in law and our industrial infrastructure; they are true national assets and the means by which DoD may gain cost-effective access to human capital that we would not otherwise have available on an independent, non-profit basis. My office directly sponsors two FFRDCs: the Rand National Defense Research Institute and the Institute for Defense Analysis. In addition, my office sets management policy for FFRDCs; and it is also responsible to Congress for administering statutory resource constraints for those FFRDCs as well as the rest of Rand (Project Air Force and the Arroyo Center) and the MITRE Corporation, the Aerospace Corporation, the Software Engineering Institution, the Center for Naval Analyses, and Lincoln Labs. Those institutions have customers throughout DoD and other government agencies.

DoD agencies may avail themselves of the expertise in those enterprises simply by funding and placing tasks with them, but there is a hitch: Congress constrains the headcounts in the FFRDCs, and we generally have more willing DoD (and other) customers than heads within the congressional constraint. The FFRDCs triage and prioritize the tasks available with an eye to preserving and exploiting their corporate core competencies for the best use by DoD, so new tasks

often are favorably considered when they directly relate to FFRDC core competencies or new needs, such as ways to support current operation—for example, the best way to search for improvised explosive devices. The system isn't perfect because of the constraints on FFRDCs, but it seems to work well enough, and our FFRDCs have proven to be a key enabler in rapidly adapting DoD assets to new missions and challenges.

Q

You are responsible for ensuring the department improves its accountability for property, plants, and equipment. Can you discuss the strategic plan/systems architecture in place for property accountability systems across DoD?

A

First, let me tell you what accountability for property, plants, and equipment means to me. It means that DoD needs to know how many ships and missiles and how much test equipment it owns and how much the equipment is worth in terms of its value on DoD's financial statement. For financial reporting, we're treated as if we are a business, like a car rental company—but instead of cars, we are talking about military equipment. And like a business, knowing what equipment we have and how much it is worth today helps us make better decisions and helps us win the public's trust.

Our initial efforts focused on valuing military equipment in compliance with the Federal Accounting Standards. We had to determine, from an accounting perspective, how much an F/A-18, a tank, or an aircraft carrier is worth. It starts with how much we paid for the military equipment—but we don't know that exactly, as our records aren't that good. So we created business processes to estimate values and an IT system (the Capital Asset Management System–Military Equipment) to track values for our military equipment. As a result of this work, at the end of fiscal year 2006—for the first time ever—we were able to report a $344 billion baseline of military equipment on DoD's financial statements. For example, through this process, we determined that an average F/A-18 aircraft was valued, at the end of fiscal year 2006, at about $66 million.

Now we are improving the reporting process. We know that an F/A-18 flown in peacetime doesn't have the same wear and tear as an F/A-18 flown in wartime—and today, we have lots of equipment used in overseas contingency operations. So we felt it was important to use metrics such as flight hours or miles driven rather than years since delivery to estimate when equipment might need to be replaced. We also know that the real cost of an F/A-18 includes not just the airframe but also engines and other costs, so we are working to find ways to add those costs to the purchase price.

The other thing we are working hard to do is to make sure we capture all the equipment on our property books. I'm not implying that we can't account for our equipment, but

often, we keep track of that equipment on spreadsheets and homegrown systems. We need to have a true enterprise capability to know what equipment we have and where it is so we can manage it better in support of our warfighters.

Q

You have a great deal of expertise in statistics, having written numerous articles on how statistics can be used—or abused—in the federal government. Is there any advice you would provide to readers on the best way to use statistics?

A

Being a statistician, I am a fan of data and of objective quantitative methods of analyzing problems. Far too often, folks don't look at or value their data. A wonderful analysis on bad data is useless. We need to start looking at our data and valuing them as the important resource they are. Further, through my statistician eyes, I'm suspicious when I see things subjectively portrayed, using display techniques like stoplight charts or cloud/lightning bolts or flowery words, but with no data. In my experience, the most convincing arguments to senior decision makers are based on well-understood data and an objective, analytically honest statistical presentation of just the facts. I've seen senior leaders visibly pleased to be shown some factual data and analysis in decision meetings, so I encourage everyone to do more of that.

I've also seen statistics used inappropriately or in ways that obfuscate rather than clarify. The average temperature in Washington, D.C., over a year is about 54 degrees Fahrenheit. We all know, however, that's not really useful for deciding what to wear. You have to use statistics that are relevant and meaningful to the circumstances. Not everyone is trained in those techniques, so my advice to the readers is to seek out some expertise from statisticians, mathematicians, operations research analysts, and so on. They really do love helping!

Q

One of the USD(AT&L)'s strategic thrusts is to "responsibly spend every single tax dollar." As the person in charge of ensuring that DoD obtains unqualified audit opinions on DoD financial statements, as mandated by the Chief Financial Officers Act, can you discuss plans for fiscal responsibility in the acquisition community?

A

Fiscal responsibility starts with you—whether you are at the lowest levels of DoD or at the very top. I've learned a lot from every boss I've had, and one thing I learned from [*former USD(AT&L)*] Mr. John Young is that we are not victims of the process—we can make a difference. If every one of us took that attitude, we would responsibly spend every single tax dollar.

Q

Thank you for your time, Dr. Spruill.

Doctor, It Hurts When I Do This...

Alan Haggerty ▪ Roy Wood

When a fellow walks into the doctor's office and complains, "Doctor, it hurts when I do this!" the doctor replies, "Well, sir, don't do that."

Despite Herculean efforts and decades of acquisition "reform," defense acquisition is in big trouble. There is a groundswell of discontent from within and outside the Department of Defense. On Jan. 27, 2009, Secretary of Defense

Haggerty *previously served as deputy under secretary of defense for international technology security. He is a retired naval engineering duty officer and ACAT I program manager.* **Wood** *is the dean of the Defense Systems Management College at the Defense Acquisition University. He has 28 years of experience in defense acquisition and has previously served as the principal assistant deputy under secretary of defense for international technology and security.*

A strong community made up of dedicated, smart, and experienced professionals, even with weak policy, will almost always succeed.

Robert Gates testified before the Senate Armed Services Committee, saying, "Entrenched attitudes throughout the government are particularly pronounced in the area of acquisition: a risk-averse culture, a litigious process, parochial interests, excessive and changing requirements, budget churn and instability, and sometimes adversarial relationships within the Department of Defense and between DoD and other parts of government. ... Thus the situation we face today, where a small set of expensive weapons programs has had repeated—and unacceptable—problems with requirements, schedule, costs and performance."

There have been more than 100 studies of the acquisition system since World War II, yet many of the improvements seem to make things worse. Few things in the system seem to be working well—from requirements to sustainment—and many things aren't working at all. For half a century, the acquisition system has been poked and prodded and reformed around the edges. Perhaps it is time to revisit some of the basic assumptions about what makes a good system and good programs—and good management.

While this article won't address every problem, there appear to be three ideas that receive much of the blame and are at the root of much of the controversy: bureaucracy, stovepiped systems, and inter-Service rivalry. Contrary to popular sentiment, we are in favor of all three. Please, let us explain.

Bureaucracy

Bureaucracies are made up of people, and those people are the operators of a complex government machine. When they work effectively toward clearly articulated strategic goals, competent bureaucracies can ensure consistency and quality and provide stability and order. Without an effective bureaucracy, there would be chaos and anarchy.

A major problem with the defense acquisition bureaucracy is that it has systematically replaced its most talented and capable bureaucrats and institutions with a rules-based, policy-driven oversight machine. In the exuberance following the end of the Cold War, DoD downsized the acquisition community and lost much of the government's acquisition talent pool. At the same time, the acquisition reform movement downplayed the government's role, turning much of the technical and management (or, dare we say it, leadership) responsibility over to defense industry. The govern-

ment acquisition community was treated as the source of the problems. Any excellence that existed was devalued, downsized, contracted out, and lost.

In hindsight, replacing an expertise-based bureaucracy with more rules and policy does not appear to be working. That has been the situation for two decades. As noted in the July-August 2009 *Defense AT&L* article "Breaking the Camel's Back" by J. Krieger and R. Wood:

> DoD operates under mountains of guidance and oversight. Since 1994, Title VIII of the National Defense Authorization Act has added more than 500 sections of acquisition provisions. The Federal Acquisition Regulation contains 1,933 pages of legalese, and its companion document, the Defense Federal Acquisition Regulation Supplement (DFARS) adds another 1,015 pages. Even the guidebook designed to help acquisition managers navigate the labyrinthine regulations and procedures is 520 pages. For comparison, *Moby Dick* is a minnow-sized 420 pages and even Tolstoy's epic *War and Peace* is dwarfed at 699 pages.

As the article further notes, "each rule and regulation was undoubtedly created over time to enshrine a good practice or prevent an egregious error, but each of those Band-Aid® fixes to the acquisition process has created" an unwieldy system of many checks, few balances, and little discernable benefit to positive acquisition outcomes.

For bureaucracies to work well, they need to be populated with individuals who have the technical and management expertise to make good decisions within a minimalist framework of policies and regulations. Rebuilding defense acquisition with talented people who are dedicated to success and professionally developed over long periods of service is the only viable answer to the long-term recovery of the acquisition system. Training, education, and experience requirements for major leadership assignments need to be enforced, and proven performers should be identified early and kept in the acquisition community. We also need to reestablish an emphasis on technical qualifications and specialization. Despite the current philosophy in the management community, good managers are not interchangeable and cannot run any sort of business, especially that of building cutting-edge defense systems.

Thus good people who are well-trained and experienced are the foundation to rebuilding our acquisition system bureaucracy. Perfect policy implemented by a weak bureaucracy will fail. A strong community made up of dedicated, smart, and experienced professionals, even with weak policy, will almost always succeed. Rebuilding that strong community must be a fundamental priority or everything else will fail.

Stovepiped Systems

The computer and telecommunication revolution has ushered in true transformation and changed the composition of

the battlefield forever. Moore's Law keeps moving along well beyond its predicted demise, churning out computational improvements in ever-increasing fashion. The promises of this new technology invoke visions of distant battles being fought from the comfort of the Pentagon's E-ring. Indeed, almost every new program concept must include the obligatory "clouds and lightning bolts" charts, indicating that they will be able to provide infallible battlefield prescience. Conventional wisdom says that every system is—or should be—interconnected, integrated, networked, and interoperable.

The problem is we don't know very well how to specify or build those systems. Lightning bolts on viewgraphs do not constitute engineering. We should stop acting as if they do. Network-centric warfare may not be as achievable—or desirable—as it has been advertised to be.

The ongoing events in the financial world offer an interesting case in point. The global financial system has become highly networked and interconnected in order to take advantage of instant and ubiquitous knowledge of world markets. According to conventional wisdom, this all-encompassing knowledge would help allay fears of the unknown, spread risks, and preclude crises of confidence. The upshot of highly interconnected global financial networks was supposed to be improved global financial stability, higher profits, and massive executive bonuses.

Reality, of course, has been very different. Jitters in far-flung parts of the globe have created global epidemics of fear and downward spirals of emotion-driven sell-offs. Conceived and managed without great care and foresight, networked systems function to spread bad information and bad effects as quickly and efficiently as good. In finance, unintended consequences turned the global system on its ear. Multiple markets were, in effect, merged inadvertently into one large, integrated one; and mitigation effects of time and distance were lost. Do we really understand the analogous unintended consequences of extreme networking in military systems? Worse, what happens to all of our networked integrated and interoperable systems when the Global Information Grid suffers a natural disaster or an intentional denial-of-service attack, virus, or Trojan horse?

Systems acquisition should consider a return to the Keep It Simple, Stupid— KISS—principle, challenging the need for tight integration and widespread interoperability. Those are nice when you can get them affordably and reliably, but it may be simply too early to get captivated with the idea of having our toasters interoperate with our refrigerators. We shouldn't stop networking, but we need to approach network architecture engineering more methodically and rationally— no more clouds and lightning bolts, please.

Inter-Service Rivalry
Command economies are failing all over the world. One of the holdouts appears to be the Pentagon. At the end of the Cold War, then-Secretary of Defense William Perry held what was sardonically called by many the "last supper," where he predicted defense industry consolidation. In the decades since, maintaining industry competition in all areas has been difficult or impossible. We have necked down to single suppliers for nuclear aircraft carriers, for instance, because the workload simply doesn't support more than one offeror. An environment has been created where market forces can no longer be depended upon to regulate prices for all defense systems. In those cases, the best assurance of good program cost performance is a talented and experienced contractor team, working alongside an expert government organization with sufficient transparency and discipline to hold down costs.

Having said that, there are untapped opportunities in which competition can be a key to affordability. Even in the cases in which we may no longer be able to rely solely on competition from the industrial base, inter-Service rivalry may be a reasonable stand-in. That is, it may be beneficial to have more than one option proposed by more than one military service for most major capabilities. We need to use the real, natural tendencies of social organizations like the military services to engender more rivalry and competition within the government. If military services were to sometimes vie for the opportunity to meet needed capabilities, more innovative and cost-effective solutions could emerge. Getting extra sets of eyes on the problem may reveal some better, cheaper, or perhaps even non-material solution the mission "owner" would not have otherwise considered. Yes, this concept generates some duplication of effort. But with the current approach, we have boxed ourselves in to single, Service-specific solutions for capabilities that, if they fail, leave us no alternative except to apply heroic efforts to salvage the program at any cost. In many cases, these heroics may be more expensive than allowing some constructive duplication of effort.

Stop When it Hurts
While this article takes contrarian stances on systemic impacts to defense acquisition, we believe there are bits of wisdom in our positions. We also believe that our current fundamental assumptions and processes have maneuvered us into the unenviable position we are in today and that unconventional wisdom may now be called for.

When a fellow walks into the doctor's office and complains, "Doctor, it hurts when I do this!" the doctor replies, "Well, sir, don't do that." Perhaps in acquisition, we should stop doing some of the same things that seem to hurt every time.

This thought piece is specifically designed to start the discussion, not finish it. We welcome you to join the conversation.

Next-Generation Sensor Technology, Now

Col. Humberto E. Galarraga, USA • Peter F. Annunziato
Shawn M. Funk • Doretha E. Green

U.S. warfighters must train to conduct military and peacekeeping operations in every possible environment, including those involving chemical, biological, radiological, and nuclear (CBRN) contamination. The Joint Requirements Office for CBRN Defense has recognized the limitations of the current chemical agent surface liquid detection capability and identified the need for an enhanced capability to detect the threat of chemical agent surface contamination. While the United States has introduced unmanned ground vehicles with mission-specific payload packages, no specific packages have yet been incorporated to perform surface or point CBRN reconnaissance or detection in limited access areas, restricted terrain, or military operations in urbanized terrain.

Galarraga *is the ECBC Detection Decontamination Engineering Group leader.* **Annunziato** *is the ECBC's Advanced Technology Demonstration supervisor and CBRN Unmanned Ground Reconnaissance ACTD technical manager.* **Funk** *is the ACTD deputy technical manager for the CBRN Unmanned Ground Vehicle.* **Green** *manages the Joint Contaminated Surface Detector. All work within the ECBC's Engineering Directorate.*

The evolution of the CBRN Unmanned Ground Reconnaissance Advanced Concept Technology Demonstration (ACTD) exploits next-generation sensor technology to demonstrate enhanced capabilities for existing mounted reconnaissance platforms and the military utility of unmanned ground reconnaissance systems for CBRN applications.

Unlike an acquisition program, an ACTD program provides an expedited method of evaluating mature technology in an operational scenario to determine if it meets operational needs. ACTDs of a deployable capability rely on warfighter involvement during a residual phase that eventually affects the development of supporting concepts of operations and tactics, techniques, and procedures. The Office of the Deputy Under Secretary of Defense for Advanced Systems and

Concepts and the Defense Threat Reduction Agency (DTRA) provided overarching program management for the CBRN ACTD.

The Need for a New Requirement

The CBRN Unmanned Ground Reconnaissance ACTD objective addressed current warfighting shortfalls and the present limitations of manned CBRN reconnaissance, including requirements for operators to dismount from their collective protection systems to survey potential contamination in vehicle-inaccessible areas. Previous CBRN reconnaissance systems used a double-wheel sampling system and a mobile mass spectrometer to detect surface contamination. The process involved rolling one of the silicon wheels behind the reconnaissance vehicle over a 55.5-meter stretch and raising it to a heated probe while the sec-

The JCSD brings next-generation sensor technology to the warfighter, offering ground surface chemical contamination detection in real time.

ond wheel was lowered to traverse a second 55.5-meter stretch. The heated probe vaporized any chemical contaminants on the first wheel, which were then transported through the sampling line of an onboard mass spectrometer for analysis and comparison to its library of threat chemical spectra. Detection and identification were made after the second wheel went through this process. The procedure was time-consuming, maintenance-intensive, and speed-limiting. The equipment was also sensitive to surface conditions and did not provide flexible use options. Those limitations restricted the CBRN reconnaissance operational tempo, placing warfighters at risk.

Furthermore, existing platforms did not offer CBRN reconnaissance capabilities in limited access areas, forcing the warfighter to conduct dismounted CBRN reconnaissance operations in mission-oriented protective posture, or MOPP, which means protective gear had to be donned to protect the warfighter from a toxic environment. Effective, timely, and accurate CBRN reconnaissance is essential to protect the warfighter and minimize the degrading effects that increased MOPP levels can have on mission objectives. Line-of-site and field-of-view considerations also limit the current CBRN reconnaissance capability.

The Joint Requirements Office for CBRN Defense recognized those limitations and identified the need for a surface liquid and solid (traditional and non-traditional) agent detection system as one of its top requirements. The CBRN Unmanned Ground Reconnaissance ACTD was intended to bridge identified capability gaps by exploiting next-generation sensor technology to demonstrate the enhanced capability for existing mounted reconnaissance platforms and the military utility of unmanned ground reconnaissance systems for CBRN missions.

The CBRN Unmanned Ground Reconnaissance ACTD evaluated two complementary program efforts related to CBRN reconnaissance, which were demonstrated in two thrust areas that are discussed in the following sections.

A Lightweight Reconnaissance System
Thrust area one focused on the integration of a non-contact surface detector—the Joint Contaminated Surface Detector (JCSD)—into a modified joint Service, lightweight nuclear,

chemical, and biological (NBC) reconnaissance system designated the CBRN Unmanned Ground Reconnaissance ACTD High Mobility Multipurpose Wheeled Vehicle Variant System, or CAHVS.

Thrust area one evaluated the JCSD as a replacement for the double-wheel sampling system for conducting route, area, and zone reconnaissance. The liquid chemical agent surface detection capability uses a combination of the vehicle-mounted mechanical double-wheel sampling system in conjunction with a time-delayed sample wheel contamination analysis by the mobile mass spectrometer. The double-wheel sampling system relies on ground contact to collect surface contamination on its silicone wheels and requires the host vehicle to limit its speed to as low as eight miles per hour—depending upon terrain—in order to maintain contact between the sampling wheels and the ground. Before the reconnaissance system can actually detect and identify agents, two of the double-wheel sampling system wheels must first traverse a required 111-meter contaminated path length of terrain, at which point the wheels are raised to the heated probe of the onboard mobile mass spectrometer for vaporization of the contaminants and subsequent analysis. In operational use, the maneuvering force had two choices: Reduce ground speed to accommodate the use of the double-wheel sampling system and mobile mass spectrometer, or press forward without knowing if the terrain is contaminated.

The JCSD brings next-generation sensor technology to the warfighter, offering ground surface chemical contamination detection in real time and providing the following capabilities:
- Liquid and solid detection of traditional chemical warfare agents, toxic industrial chemicals, and non-traditional agents
- Reconnaissance operations, conducted at maneuver speeds
- Concurrent detection/identification of multiple classes of compounds.

The JCSD employs Raman technology to detect and identify chemical contaminants on surfaces in less than three seconds at maneuver speeds up to 45 miles per hour. When light from its 248-nanometer laser bounces off the chemical contaminant, a small fraction shifts slightly to another wavelength. By analyzing that shift (called the Raman shift), the JCSD can identify the chemical by comparing its spectra with those in its onboard library. It also has the capability to record unknown spectra for subsequent analysis should the threat chemical not be contained within its library.

Testing the Vehicle
The Edgewood Chemical Biological Center (ECBC) Research and Technology Directorate tested the JCSD against the chemicals on the current chemical biological mass spectrometer Block II agent list, a number of non-traditional

agents, and 10 to 12 liquid toxic industrial chemicals. The selected chemical agents are priorities on the U.S. Army CBRN School threat list.

The CAHVS configuration included a NBC detection suite integrated into a M1113 HMMWV with a hard cab and a modified S-788 lightweight multipurpose shelter. The NBC detection suite included the JCSD, the mobile mass spectrometer, a point chemical agent monitor, a chemical agent detector alarm, a radiation detection device, a navigation suite, secure communications, an area marking system, a meteorological device, and collective protection. To offset the weight increase associated with the JCSD, the team replaced the joint biological point detection system with a reconnaissance variant, which consisted of a biological agent warning sensor IV, portal shield purge assembly, and a dry filter unit. The chemical biological mass spectrometer received an additional biological box to augment the biological capabilities of the joint biological point detection system reconnaissance variant. The CAHVS modifications maintained the original platform's CBRN defense capabilities.

During the course of the CBRN Unmanned Ground Reconnaissance ACTD, the JCSD successfully completed technical and operational demonstrations and surety testing. Demonstrations confirmed the JCSD can detect chemicals on various surfaces while moving at speeds of up to 45 miles per hour as it is operated by the warfighter. Surety tests showed the JCSD can detect traditional chemical agents, non-traditional agents, and toxic industrial chemicals on various surfaces as well as in the presence of common battlefield interferents.

The operational manager, U.S. Army Pacific, has expressed great satisfaction with the results of the operational demonstrations and provided a positive joint military utility assessment in June 2009. The Office of the Joint Project Manager for Nuclear, Biological, and Chemical Contamination Avoidance designated the Stryker Armored Vehicle as the platform for JCSD integration. The JCSD transitioned as a program of record to the Joint Program Executive Office for Chemical and Biological Defense/Office of the Joint Project Manager for Nuclear, Biological, and Chemical Contamination Avoidance in June 2009.

An Unmanned Ground Vehicle

Thrust area two, the CBRN Unmanned Ground Vehicle (CUGV), focused on the integration of existing chemical and radiological detectors onto an existing robotic platform to evaluate a new capability of conducting dismounted reconnaissance in confined spaces. The CUGV was originally viewed as an additional tool for manned reconnaissance vehicles, which are used for area, route, and zone reconnaissance. In the performance of such missions, the vehicle crew can remain safely inside the collective protection of the host reconnaissance vehicle. However, the reconnaissance vehicle is often too large to allow the investigation of

buildings, tunnels, caves, or other confined spaces that may be encountered on the battlefield, requiring warfighters to dismount the collective protection of the reconnaissance vehicle to perform a manned reconnaissance.

Thrust area two's effort involved providing a deployable, unmanned reconnaissance capability for areas inaccessible to vehicles. Midway through the CBRN Unmanned Ground Reconnaissance ACTD, emphasis shifted from providing a deployable reconnaissance asset out of the manned reconnaissance vehicle to providing an unmanned platform in support of assessment operations.

The CUGV improves the conduct of dismounted ground reconnaissance and sensitive site assessment by having robotic first entry into potentially hostile environments instead of the warfighter. This ability will create greater flexibility on the battlefield and increase the protection of warfighters in CBRN-contaminated environments.

The ACTD CUGV was successful in delivering a new deployable capability that would allow the warfighter to conduct unmanned chemical and radiation detection.

The CUGV effort concentrated on combining currently available chemical and radiological sensors onto an existing robotic platform to address various areas of risk identified by combatant commanders. Specifically, the CUGV effort selectively integrated chemical warfare agents, toxic industrial chemicals, and radiation detectors into a flexible payload module that provided warfighters with the ability to configure the payload elements for specific mission profiles. Primary CUGV capabilities are:
- Remotely operating unmanned chemical and radiation detection in areas where tactical vehicles cannot access or the threat to the warfighter is too great (e.g., urban terrain, caves)
- Determining oxygen levels, volatile organic compounds, lower explosive limits, temperature, humidity, and detection of toxic industrial chemicals in confined areas
- Collecting chemical air and surface samples for subsequent analysis
- Transmitting chemical and radiation detection information from the CUGV to the operator control unit situated in the reconnaissance vehicle and/or held by the dismounted warfighter in the clean zone.

Fielding the Vehicle

The 95th Chemical Company, U.S. Army Alaska, employed the CUGV during the operational demonstration in Sep-

The CBRN Unmanned Ground Reconnaissance ACTD "exemplifies the Department of Defense's ability to quickly develop a prototype and get it in the hands of the warfighter. The ACTD was a model of teamwork between military services and industry partners."

Col. Humberto E. Galarraga, U.S. Army ECBC Detection Decontamination Engineering Group leader

tember 2006, and U.S. Army Pacific provided a favorable joint military utility assessment in April 2007. The CBRN Unmanned Ground Reconnaissance ACTD team then provided two CUGV systems to the 95th Chemical Company for fiscal years 2007 and 2008 to execute the residual phase of the program. During those two years, the CBRN Unmanned Ground Reconnaissance ACTD team maintained the CUGV systems for the 95th.

In addition to the official residual systems, the CBRN Unmanned Ground Reconnaissance ACTD Team also provided CUGV systems to U.S. Army Pacific and the U.S. CBRN School for use in further concepts of operations and tactics, techniques, and procedures development. At the conclusion of the ACTD in October 2008, the operational manager requested to keep three CUGV systems. With approval from DTRA, the technical manager at ECBC refurbished and upgraded the systems. The U.S. Army Development Test Command provided the safety confirmation for the CUGVs' return to U.S. Army Pacific and U.S. CBRN School.

The CUGV transitioned to the Office of the Joint Project Manager for Nuclear, Biological, and Chemical Contamination Avoidance in June 2007. The CUGV is currently being considered for inclusion in some of the monitoring and surveying sets, kits, and outfits part of the Joint NBC Reconnaissance System Increment II.

The DTRA Joint Science and Technology Office assigned the ECBC Engineering Directorate the role of technical manager for the CBRN Unmanned Ground Vehicle ACTD. ECBC became responsible for program management, budgeting, and the technical effort. Under the leadership and supervision of Peter F. Annunziato, a co-author of this article, the program ensured a swift transition of the CUGV to four government organizations—the Office of the Joint Project Manager for Nuclear, Biological, and Chemical Contamination Avoidance; the Navy Explosive Ordnance Disposal Technical Division; the Future Combat System Small Unmanned Ground Vehicle; and the Joint Product Manager Consequence Management—for production and fielding.

In addition to the four government transitions, ECBC and iRobot Corporation established a cooperative research and development agreement in February 2008. The agreement provides great benefit to the Department of Defense by allowing the CUGV team to implement additional improvements to the vehicle. It also involves providing iRobot with the technical data necessary to enable commercialization of the CUGV, potentially benefiting the warfighters and first responders by providing a commercial alternative for robotic reconnaissance in times of urgent need.

Overall, the ACTD CUGV thrust was successful in delivering a new deployable capability that would allow the warfighter to conduct unmanned chemical and radiation detection. The capability was delivered within a two-year timeframe with a substantial $3.18 million savings; the funds were used to improve the JCSD performance capability and its software and hardware reliability.

The technical innovations proven through this program are leading the way for rapid technology demonstrations that adjust in near-real time to changes on the battlefield and new defensive requirements. As operational realities shift, development and demonstration of new defensive capabilities in the CBRN arena become even more urgent to ensure that the military can fight and win in any condition and properly prepare for the threats of tomorrow.

The CBRN Unmanned Ground Reconnaissance ACTD "exemplifies the Department of Defense's ability to quickly develop a prototype and get it in the hands of the warfighter. The ACTD was a model of teamwork between military services and industry partners," said Col. Humberto E. Galarraga, U.S. Army ECBC Detection Decontamination Engineering Group leader and co-author of this article.

NOTE: Annunziato's technical acuity and ability to simultaneously manage the two thrusts of the ACTD earned him the 2009 Gold Award for "Outstanding Supervisor Grade 13 and Above" by the Baltimore Federal Executive Board.

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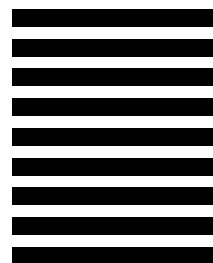
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Advancing EVM and Government Contracting Efficiencies

Daniel A. Zosh
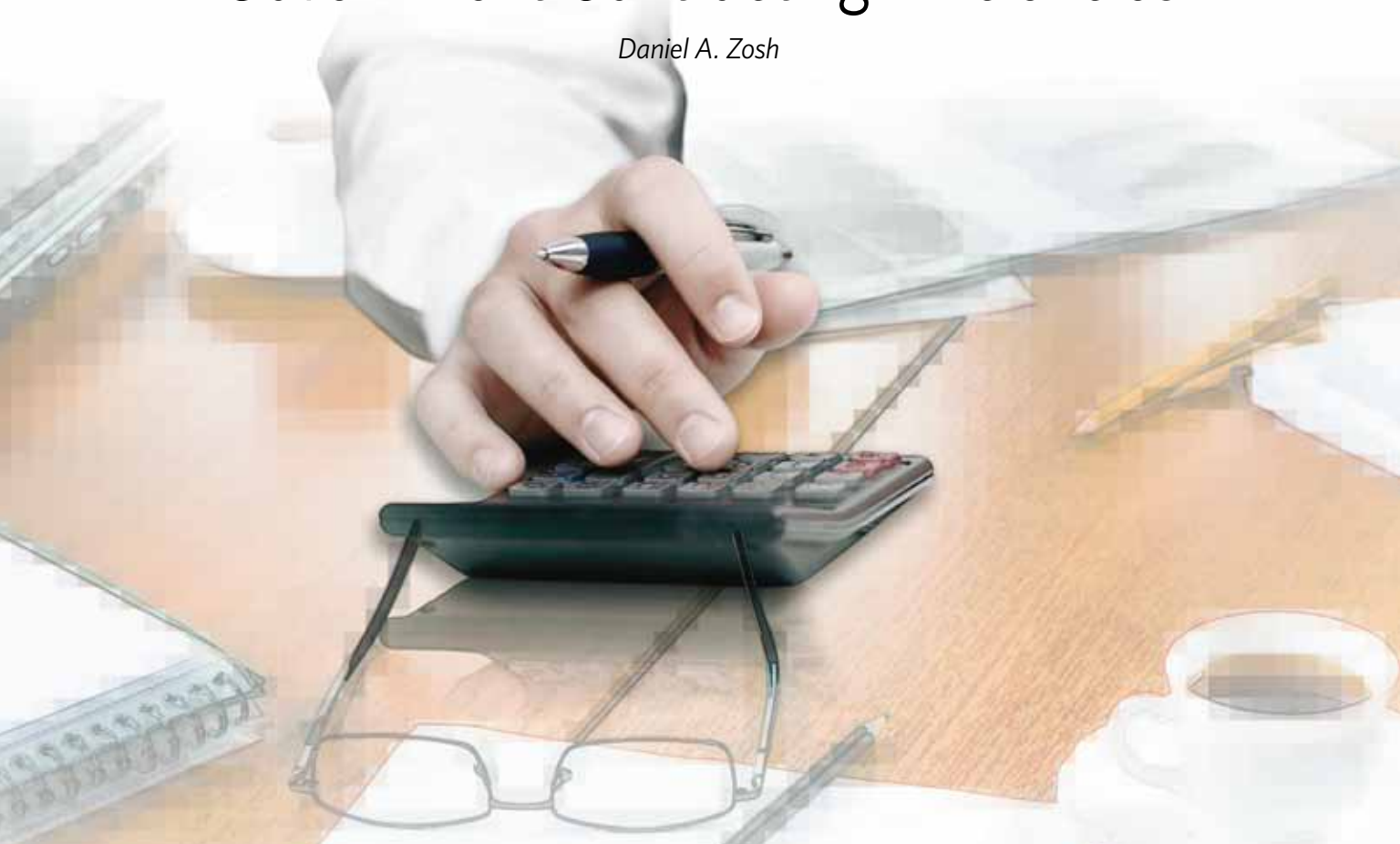
Earned value management processes and software tools are only as good as the system and the data for which they are implemented. Consideration of underlying contractor motives will lead to a better understanding today as to why EVM is not embraced by the majority even if there is belief that EVM tools are the answer to maximizing efficiency gains and promoting cost-saving benefits.

Focusing on the Department of Defense weapons system acquisition process, let's begin with a few age-old questions: Why do DoD contracts overrun on a consistent basis? Why are contractors motivated to add scope of work to existing contracts? Why isn't EVM embraced as the best project management tool for advancing government contracting management efficiencies?

*With more than 20 years of training and consulting experience in project management using cost and schedule controls, **Zosh** provides worldwide industry-leading EVM expertise on a regular basis.*

EVM system guidelines and procedures have been a part of the weapons system acquisition process for more than 45 years. Over the years, it had different labels—Cost\ Schedule Control Systems Criteria, or CSCSC, is one—but its base philosophy has not changed. What *has* changed is the introduction of incredibly efficient software tools used to implement EVM practices. At no other time in the history of government defense systems acquisition have there been such advanced capabilities to manage risk, reduce cost, and maximize contracting efficiencies. So what's wrong? Why aren't we beginning to see government contracts underrun instead of overrun?

A Simple Concept

Following government-required guidelines for EVM implementation can be a rather elaborate endeavor for contractors; however, the concepts of EVM are really quite simple. EVM is most effective when applied in its purest state: in a commercially profit-motivated environment where project management efficiency needs to be maximized to reduce costs and increase profits. Depending on whether it's for government, oil and gas companies, big pharmaceutical companies, construction, high-tech/new-tech industries, or the automotive industry, the project management tracking structure may be called something different and may not use the same terms as we use in EVM, but the concepts are the same.

Management systems are structured to track progress against a formulated baseline, with deviations from that baseline calculated to express variances; and those variances are assessed and prioritized for management action to mitigate risk. The question is whether the contractor is motivated to produce a superior product ahead of schedule and under cost. That will dictate whether EVM is used to manage the effort or is simply exercised to satisfy government requirements for data delivery and adherence to EVM guidelines.

The Right Way

Successful execution of an EVM system, validated or not, depends heavily on whether the system is used to report data or to manage the project. The system should always be used to manage the project, with data being used to verify integrity of the project to mitigate technical, cost, and/or schedule risk through identification of problem areas and to adopt management decision-making processes to:
• Realign resources (if required)
• Correct systemic issues
• Check schedule logic
• Re-evaluate trade space
• Recommend technical tradeoffs using cost as an independent variable, or CAIV, principles
• Reprogram work, budget, or resource mix
• Implement other management actions.

The Problem

In a typical DoD weapons system procurement, much of the cost of the system is expended during research and development and, therefore, there's a large amount of profit consideration given to the contractors' developing systems that exist only on paper as technical specifications. The government customer typically takes on the predominant amount of risk at that stage of a weapons system life cycle because it is paying the contractor to develop the system with a profit margin included based on the size of the contract. On a $1 billion contract with an 8 percent negotiated fee, the contractor profits $80 million. If the contract grows (via amendments) to $1.5 billion, the contractor profits $120 million. Therefore, the contractor has an underlying motivation to grow the value of the contract with additional scope of work.

Without cost and schedule performance incentives, the contractor profits the most by adding more requirements and scope of work to the contract and delivering the product on time and on budget. That doesn't necessarily equate to developing a product with maximum efficiency in an attempt to deliver ahead of schedule and under budget. It also gives us a perspective as to why government contractors are not particularly interested in underrunning contracts unless there is a specific incentive agreement that generously rewards doing so.

Extending this thought, let's review some examples that highlight the underlying problem:

Scenario 1
Original contract base value is $100 million, 8 percent fee, and a share ratio over/under of 80/20. The contractor underruns 10 percent. Fee is $8 million plus $8 million underrun (80 percent share of $10 million underrun) equals $16 million profit for performance of 1.1 cost performance index (CPI). (This is phenomenal performance by today's standards, and it rarely, if ever, happens.)

Scenario 2
Original contract base value is $100 million, 8 percent fee, and a share ratio over/under of 80/20. The contractor overruns 5 percent. Fee is $3 million ($8 million minus $5 million overrun) plus $1 million (20 percent share of the government in the overrun) equals $4 million profit. The contractor adds 100 percent modifications and performs at CPI 1.0, which means an additional $8 million fee, equaling $12 million total profit. That is $4 million less than the very-aggressive scenario 1. However, let's say the overhead rate for this contractor is 200 percent ($2 for every $1 direct), and if the contractor could reduce overhead by 20 cents, or 10 percent for this contract, by adding more work, that would save $6.6 million, making real profit plus savings equal $18.6 million if the contractor could extend the contract and add $100 million in contract modifications. How I calculated that number: $100

million contract modification equals $33.3 million (direct), $66.6 million (indirect). Reduce indirect cost by 10 percent by adding contract modifications, 0.10 times 66.6 equals $6.6 million savings. The profit is increased by $2.6 million by overrunning and adding scope of work to the contract.

This scenario is normal government contracting practice today. Government contractors are motivated to add scope of work, extend schedules, and overrun the base contract to gain higher profits via increased contract value and decreased overhead costs.

Scenario 3
Original contract base value is $100 million, 8 percent fee, and the government contracts for a $15 million incentive fee for on-target performance or better (CPI – 1.0 or better; on schedule or better) and eliminates profit/loss share ratios. The contractor performs at CPI 1.1, and the schedule is on target. The profits are calculated as follows: $8 million (fee) plus $10 million (underrun) plus $15 million (incentive fee award), equaling $33 million total profit.

The benefits of scenario 3 are:
- The contractor is strongly incentivized to become highly efficient, thereby placing a great deal of reliance on EVM to mitigate risk and find and resolve problems quickly.
- The government takes delivery of the product faster.
- The government has tangible savings of approximately $94 million (in scenario 2, the costs equal $217 million, while in scenario 3, the costs equal $123 million).
- The contractor's profit is higher ($33 million in scenario 3 versus $18.6 million in scenario 2).
- There is reduced government oversight cost as the contract period of performance is reduced (intangible savings).

That brings us back to the true purpose of EVM principles and tools: to control cost, schedule, and technical risk. In essence, EVM allows the government to identify risk and maximize efficiency to reduce that risk so a technically superior system can be produced for as little cost and in as little time as possible.

Those scenarios highlight the reason why EVM has difficulty being embraced: the defense industry does not properly incentivize its contractors to underrun costs and deliver ahead of schedule. Even with firm fixed-priced contracts, there is strong motivation to grow the contract value with added scope of work requirements. As noted previously, an additional consideration is the positive effect on the corporate indirect overhead rate reduction when contractors' direct value is increased and the schedule is lengthened. As a government team representative, I once asked a control account manager why he wasn't trying to close out his work packages ahead of schedule, and he explained there was no reward for doing so. That is true in most contractual arrangements, in which the motivation is to stay on target rather than ahead of target. If EVM is being used only to provide customer reports verifying that the contractor is within acceptable index thresholds (CPI, schedule performance index, to complete performance index, baseline execution index, and critical path length index), then the full use of EVM principles and tools are drastically undermined. The optimal point of profit maximization for contractors is 1.0 CPI or better. There is, however, little motivation to achieve that index as it does not promote a reasonable argument for modifying the contract to add value and extend the schedule; that is, if everything is going well, then there is no reason to add contract changes and modifications to the contract budget base.

How Should EVM Work?
Let's consider EVM in a free market profit-motivated scenario and use the Apple® iPhone as an example. Apple is strongly motivated to build the best product for the least amount of cash and in the least amount of time because they receive higher profits by reducing the time to market, allowing revenues to grow as quickly as possible and outpacing the competition. In addition, Apple takes advantage of the iPhone's hype at its pinnacle, leading to greater profit potential. When Apple maximizes operational, developmental, and production execution, investors rush to buy stock, significantly increasing Apple's market capitalization.

On the government side, because of policies legislating arms sales, there is a great amount of uncertainty in how much a defense contractor can profit by selling production copies to other countries. Therefore, "rush to market" in the government business is not nearly as effective as it would be in a free market commercial enterprise system. EVM implementation in such a scenario can be used to maximize the management efficiency during the product development cycle to prevent and fix problems, thereby reducing risk.

This assessment doesn't spell doom for EVM system effectiveness within the confines of government contract structures. Not a whole lot has changed in the way government contracts have been managed in the last 20 years;

Why isn't EVM embraced as the best project management tool for advancing government contracting management efficiencies?

however, an EVM system that meets DoD guidelines will continue to identify areas of risk and will assist in making accurate performance predictions on future work. The downside is that much of the responsibility for analysis and assessment will fall on the doorstep of the government program office and the Defense Contract Management Agency, who must share the burden of EVM project management and surveillance with the contractor. That can be a bit of a struggle, as contractor motives do not always align with government motives. When motives differ, it will be up to the government side to make sure the prime and sub-contractors adhere to EVM principles. Although DoD has a working arrangement to allow EVM to function, EVM is not used as efficiently and effectively as it would if the contractor and government were to team together to attain the same goals, to deliver a superior product ahead of schedule (if possible), and underrun the cost (if possible).

Why should we be so concerned about the government building products faster, better, and cheaper? Because the funding comes directly from taxpayer dollars, and when those dollars are not spent efficiently and do not provide a good return on what is spent, the entire U.S. economy is affected negatively. So what can be done, and how can current ways of doing business change so EVM can be used for its intended purpose—to manage project performance—and not simply to deliver data?

Recommendations

I hope that, what you read in this article will provoke some thoughts as to what can be done to make EVM more effective in managing government contracts. Here are a few of my own thoughts:

• Change the way contracts are structured. Provide heavy incentives for underruns against the original program baseline (contract modifications will not receive incentives), for meeting key technical milestones, and for deliveries ahead of schedule (also against the original baseline). Why is this difficult? It runs contrary to the way the government does business and allocates funds. The government traditionally does not spend or allocate funding in attempt to save on the overall project cost, and it usually ends up spending much more than it could have saved if it had motivated the contractor with monetary incentives. The closest contract type to this recommendation is fixed-price incentive fee. The incentive fee, however, is typically so miniscule when compared with the incentive to add scope to the contract that it doesn't really have much impact on a contractor's performance, and the contractor somehow manages to get most of the incentive fee even if performance isn't very good (less than 1.0). Awarding incentives for performance would require tracking the baseline data separately from new contract modifications.

• Do away with underrun share ratios. If the contractor organization underruns, it should be entitled to the entire amount and even be rewarded with additional incentitves. Contractors need large incentives to underrun, and if incentivized, they will use EVM to manage their projects to maximize efficiencies and reduce risk.

• Penalize contractors for not meeting contract deliverable milestones and requirements. Always track the contractor to the original baseline without intermingling contract changes that skew performance on the original set of requirements. Penalize the contractor for poor performance on the original baseline by decreasing the contractor's negotiated fee percentages on the contract change portions of the effort.

• Do away with overrun share ratios—up to a point. The contractor needs to take on the entire burden for an overrun up to the price at completion (negotiated contract cost plus fee). Once the price at completion is realized, a share ratio will kick in.

A great deal of government oversight cost could be reduced if contractors were incentivized properly to adhere to EVM guidance and to streamline their EVM processes, giving them stronger chances to meet government award fees for underrunning. Award fees or bonuses need to be high-percentage values on the contract and will promote adherence to EVM and ease the need for constant oversight and push mechanisms for EVM that are so prominent in today's industry.

Pull, Don't Push

In light of the worldwide economic dilemmas being faced today, something needs to be done to increase the efficiencies of government acquisition contracting practices and project management oversight processes. EVM is an efficient and effective tool for measuring progress and identifying areas of risk, and it can be applied to any industry. EVM implementation and execution on government contracts sometimes encounters difficulties because contractors do not fully embrace the concept with the full intent the government wants to see imposed, or contractors will perform and report to EVM standards because they are required to do so. Contractor motives do not always align with those of the government, and this is especially true when it comes to EVM principles on government contracts.

Instead of pushing contractors to adhere to EVM guidance, there has to be more pulling them into the process, and that will happen when contractors are incentivized properly to achieve underruns. If the correct steps are taken, EVM teamwork between the contractors and government agencies will benefit both sides greatly, resulting in billions of dollars in savings for the government and greater profits for the contractor.

The Importance of
Litigation Management

Stephen Rinehart

For the past 14-plus years, the U.S. government has been engaged in litigation stemming from a single program, putting more than a billion dollars' worth of Department of Defense funding at risk. The issue was finally resolved, as the supplier (plaintiff) withdrew its complaint as part of a quid pro quo settlement in which the government withdrew its own complaint (another potential significant litigation) on another issue.

Why was such litigation conducted in the first place? Primarily because the supplier incurred a significant loss of revenue as it attempted to fulfill the requirements of a mutually agreed fixed-price incentive fee-type contract. The company believed it could recoup all, or at least a significant part, of the loss through legal action. Initially, the supplier submitted claims to the government,

Rinehart, *a retired Army colonel, serves as the lead acquisition program management analyst for a major DoD litigation activity.*

arguing that the government was responsible for the loss. The government denied the claims, and the supplier submitted a complaint to the court.

The court's responsibility was to identify the relevant facts and to decide the outcome of the disagreement based on input presented by both the plaintiff and the defendant. In such a situation, it was fundamental that the relevant facts be identified and understood by the court and by both parties during the claim investigation process and court proceedings.

Putting Billions of Dollars at Risk

Litigations present a very serious problem for the military acquisition community. How is it that two parties—government and industry—can work together for years using management principles developed over decades, and at the termination of the project, argue who was responsible for hundreds of millions of dollars in program loss that occurred during the life of the program? The facts surrounding the issues should have been known and mutually understood by both parties long before program termination. What weaknesses in acquisition management practices allow such a disparity to occur?

Fundamental Truths

There are a number of fundamental truths when it comes to DoD materiel acquisition management practices. Firstly, companies address issues with other companies and customers as a normal basis of business. Government, as a customer of industry, should expect the same treatment and should expect requests for equitable adjustment (REAs),

claims, and litigations. Program offices need to assume REAs and claims will happen and to manage accordingly, starting from the beginning of the program. The better prepared a program office is, the more effectively it can deal with such issues. If a program office is not prepared, then it could find itself spending money—lots of money—if a litigation occurs.

Secondly, program execution activities normally focus on the status of today and where they will be tomorrow. REAs, claims, and litigations focus on yesterday and how the past affects an industry organization's profits today. Currently, program offices collect much of the relevant historical data needed to address REAs, claims, and litigations; however, the data are not maintained in formats conducive to properly addressing the types of issues that most likely will be found in REAs, claims, and litigations.

Program offices need to assume REAs and claims will happen and manage accordingly.

Thirdly, the program baseline is composed of a baseline schedule, budgeted program expected costs to accomplish the baseline schedule, and a negotiated contract agreement that is aligned with the baseline schedule and budgeted costs. Those three components contain a set of interdependent parameters that need to be managed accordingly. For example, in a fixed-price incentive fee-type contract in a loss position, the relationship between the program's expected cost and the contract ceiling value identify the program loss. The "when and why" of the evolving relationship of those two parameters should be maintained.

Lastly, in litigation, absolute historical accuracy may not be relevant; rather, what the court understands the historical accuracy (facts) to be is relevant. Documentation, written and acknowledged contemporaneously by both parties as fact, is compelling information for the court. Accordingly, program offices should:
- Trust each other, but verify information
- Document, in real time, the ramifications of the evolving baseline parameters
- Maintain comprehensive historical records
- Develop procedures for establishing contemporaneous formal acknowledgement from both parties that the documented content is fact. If either party does not consider it fact, then that is the time to examine why (not when the problem is brought to court).

Figure 1. **Program Mismanagement Cycle**

Optimistic Technical and Management Program Execution Assumptions
Leads to

▼

Optimistic Baseline Program Schedule and Expected Program Cost
Leads to

▼

Schedule Pressures and Added Program Costs
Leads to

▼

Program Rebaseline Action

▼

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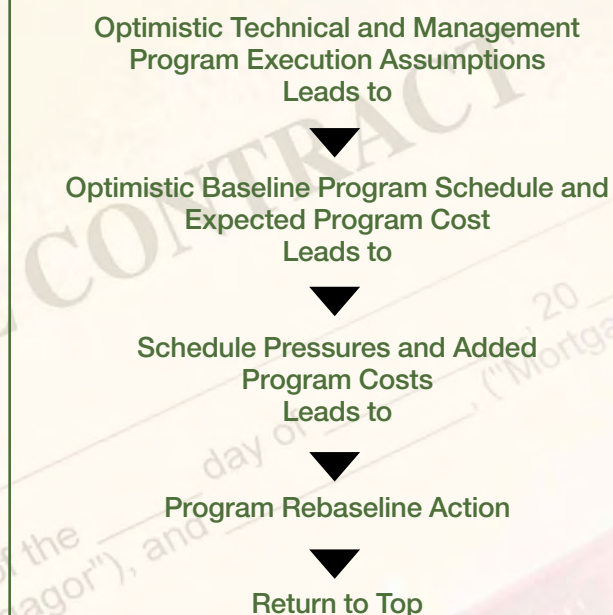
Management Enhancement Recommendations

The following lists a number of recommended management enhancements that could help a program office be better prepared to address REAs, claims, and litigations. Many of these recommendations also may help program offices better manage their ongoing programs.

Contract Change Management/Constructive Change Prevention Practices

If there is a change in a contract, here are some effective contract change management practices:

- Establish release clauses and ensure both parties formally agree that a release wipes the slate clean for all but formally identified exceptions
- Maintain a historical conformed contract that all parties can access, and be able to identify conveniently the complete contract for any day from contract award forward. This recommendation can be accomplished electronically. It can be a convenient aid to members of the program office as well as to attorneys.

Constructive change occurs when the customer requires the supplier to perform tasks that are outside the scope of the contract without issuing a formal change order. Constructive change is to be avoided. The two parties may have different ideas regarding whether or not a customer directive is constructive change because what construes a constructive change often is in the eye of the beholder and can change over time. That is especially true when both parties are faced with the potential for claims and or litigation.

Constructive change prevention practices must be comprehensive and effective. When seeking to prevent constructive change, address all activities: meetings, actions items, verbal and written communications, etc. Get documentation, which

> **For a program in a loss position, the when-and-why details for the evolving loss should be available to both parties in a conveniently readable format.**

means you need to get real-time acknowledgement from the supplier that all activities (requested either verbally or in writing) are either in scope or not in scope. These recommendations also can help identify and manage activities that may be increasing the work effort but are considered within the general scope of the contract.

Memorialize a Program Rebaseline

A program rebaseline occurs when the baseline schedule is not executable or when the operating schedule and baseline schedule are sufficiently different, leading to limited relevancy. The rebaseline activities normally include aligning the baseline schedule to the realities of the operating schedule, budgeting the expected program costs to the new baseline schedule, and aligning the contract with the new baseline schedule and expected cost—in essence, updating the program baseline (schedule, expected cost, and contract) to the current program conditions.
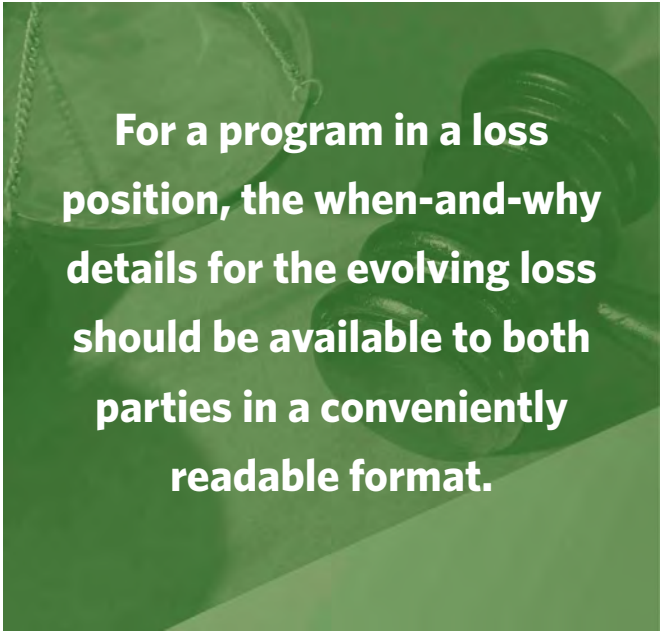
Issues generated during the previous baseline should be resolved to the fullest extent possible, and both parties should understand and acknowledge any resolutions identified in the contract change (i.e., release clause) or in a post-rebaseline activity summary. The intent should be that both sides agree that no claim/litigation activity is warranted for actions occurring during the previous baseline. Exceptions should be specifically identified in the contract change that memorializes the new program baseline.

For contract changes that memorialize a program rebaseline, the following actions can help prevent problems:

- Ensure the contract change identifies the specific baseline schedule and program expected cost (baseline schedule, program expected cost, and contract parameters should be viewed as a set of interdependent data)
- If aspects of the rebaseline activity need to be documented or if comments in the contract change need further explanation, then write a post-rebaseline activity summary and have it signed by both parties.

Schedule Tracking Management Practices

Program cost increases most often occur because the supplier is not able to maintain the program baseline schedule. In many cases, the fundamental reasons for the schedule increases are not known by the program office because they are inherent to supplier processes and procedures and/or are the result of issues occurring levels below the level of the program office management schedule oversight. For example, the program office may be led to believe that a specification change caused a three-month delay when, in fact, the supplier is late because he is not able to meet his internal drawing release schedule. Understanding, in detail, the supplier's ability to complete the schedule should help reveal the root causes for schedule delay, leading to effective corrective actions and a more reliable baseline schedule—helping a program to avoid the dreaded program mismanagement cycle. (See the figure

for an overview of the cycle.) The government needs to know such a level of detail when facing litigation.

Some tips that may help better manage a program and prevent litigation; or if litigation occurs, may help make the process easier:
• Establish independent schedule oversight capability
• Track top-level and key lower-level critical paths
• Evaluate, in detail, the supplier's ability to complete the schedule (e.g., the schedule can appear to be executable but still not be achievable by supplier).

Cost Tracking Management Practices
To better track the cost of a program, program offices should:
• Establish a historical baseline cost tracking ability
• Document the when and why for baseline changes
• Document the when and why for changes between the program's expected cost and the contract ceiling value relationship—this is very important!

Such information is available in the supplier's cost performance reports and other documentation provided to the program office; however, the information is often provided to the program office as separate data items and as point estimates for a specific moment in time. Understanding the significance of the data is similar to attempting to see the picture of a 1,000-piece puzzle while the pieces are scattered randomly on a tabletop. When collected over time and presented in a convenient, readable fashion, one can quickly understand the when and why of program cost increases; however, someone needs to take the time to review the data. For a program in a loss position, the when-and-why details for the evolving loss should be available to both parties in a conveniently readable format, and subsequent claims need to correlate with the data.

Customer/Supplier Interface Management Practices
Some good customer/supplier interface management practices:
• All formal and informal communications should be summarized in writing.
• The customer and supplier must concur with the content of all written documents.
• The customer and supplier must have contemporaneous access to a library of all written documents.

E-mail can easily facilitate those practices. If e-mail is used efficiently, suppliers and customers can quickly and conveniently tap the historical documentation relevant to the issues at hand. Attorneys would have immediate access to documents, with content formally concurred by both parties, that can be the basis for addressing a claim or litigation issue. Additionally, there are many indirect program management benefits. For example, the supplier and customer would tend to be more careful with what they write, since
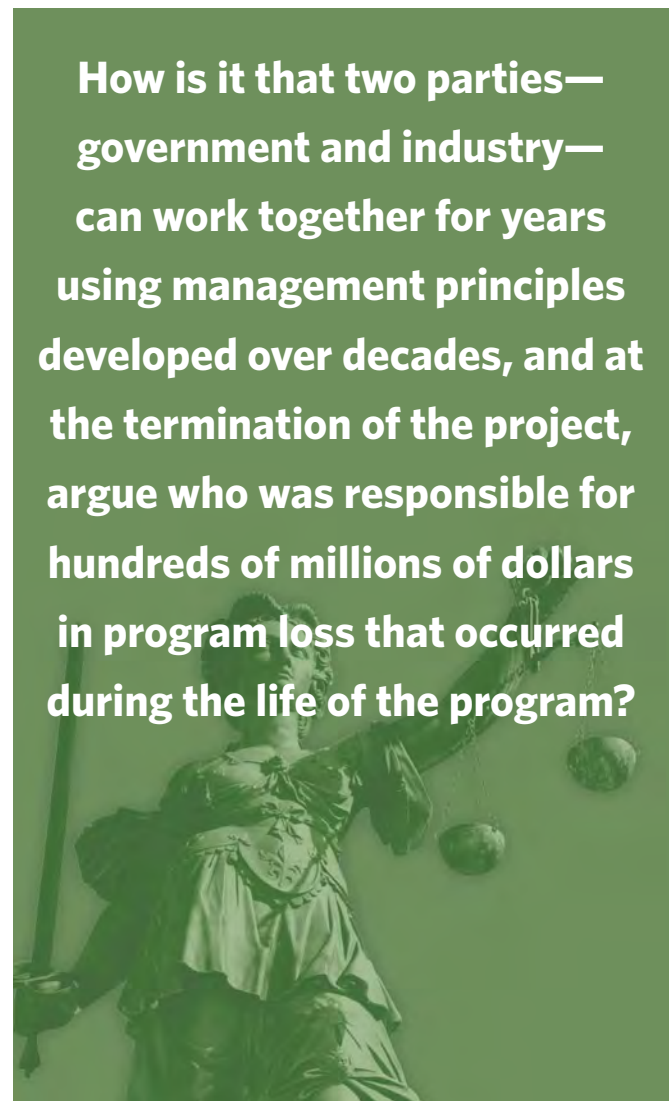
How is it that two parties—government and industry—can work together for years using management principles developed over decades, and at the termination of the project, argue who was responsible for hundreds of millions of dollars in program loss that occurred during the life of the program?

the information would be available to subordinates, peers, and supervisors.

Proper Preparation
The recommendations in this article may appear cumbersome; however, REAs, claims, and litigations will happen. The better prepared a program office is to address such issues, the greater the opportunity for a positive outcome for both supplier and customer.

The recommendations have many secondary positive effects for current programs. For example, the sooner one understands the actual program schedule, the sooner the real costs for a program are known. Management at all levels can better plan activity and budgets with less turbulence. In the end, we may be able to more efficiently equip the warfighter with the tools that are needed.
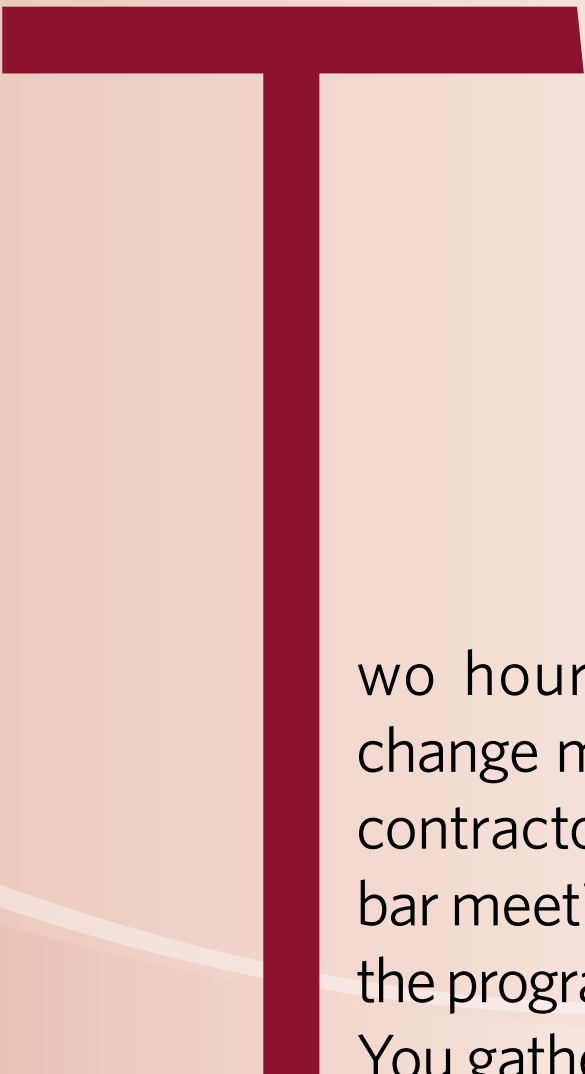
Contracting
Made Easier

The Engineering Liaison Office

Kathy Loudin

T

wo hours of technical interchange meetings at your prime contractor's facility, three sidebar meetings with key players in the program office, and it's noon. You gather two colleagues from the systems engineering team

and then hit the road for the 45-minute drive back to your own office, where you hope to spend the rest of the afternoon catching up on phone calls and reports with your project team.

As you fasten your seatbelt, your PDA begins to vibrate. You pick it up, just in case it's your boss calling with a few quick questions about next week's technical review.

Loudin *is a professor of business management at the Defense Acquisition University.*

"Tom here," you respond. Too late, you realize it's not your program office, but someone from your contracting shop.

"Hey, Tom! Just calling to remind you that we can't get your support contract in place this fiscal year—not unless you get us the procurement data package by close of business tomorrow! You know how it is. … We got hammered with funding actions during the fourth quarter, so we had to establish an earlier cut-off date for new contracting actions."

"Tomorrow? Close of business?" You sigh audibly, muttering something about checking the evaluation criteria with your technical team and generating the funding document with your financial people.

After ending the call, you vent to your colleagues. "Just what I don't need right now: support contractor issues! If I don't have a cohesive team in place to start up the new fiscal year, we won't be able to meet the next milestone. What a feeble excuse! I can't exactly tell the program office that our support is gone just because I missed some administrative deadline. Paperwork, paperwork!"

Procurement Problems

As that scenario demonstrates, organizations face many real-world barriers to effective procurement. Balancing the often-competing values of project managers (getting things done in a timely manner, with minimal distractions) and contracting professionals (working within the rules to assure decisions in the best interest of the government) is a challenge common to many organizations. In fact, the problem extends beyond the Department of Defense to confront a whole universe of bureaucratic organizations.

A 2007 study by Sanjay K. Pandey, David H. Coursey, and Donald P. Moynihan on barriers to effectiveness within bureaucracies ("Organizational Effectiveness and Bureaucratic Red Tape: A Multi-method Study," *Public Performance and Management Review*) identified procurement/purchasing rules as one of the top impediments to successful performance. (Other barriers were human resources rules, information systems constraints, budgeting processes, and communication problems.) The researchers concluded that a flexible, innovative (i.e., a learning) culture can overcome many of these problems.

The Indian Head Division (IHDIV) of the Naval Surface Warfare Center, a research laboratory specializing in energetics and weapons development, is just that sort of flexible organization—one capable of using hard-won knowledge to improve its procurement processes, increase customer satisfaction, and save money.

The Engineering Liaison Office

In April 2006, the laboratory's leaders conducted a rapid-improvement event, which revealed that every time a new contract exceeding the simplified acquisition threshold was required, IHDIV's Procurement Department expended an average of 80 hours per customer (i.e., the requiring activity) on basic education. Even training for procurements using simplified acquisition procedures (in accordance with FAR Part 13) averaged 14.5 hours per customer. Providing upfront training and education of customers was only the beginning; and producing an acceptable, contract-worthy package could take eight months or more in some cases. As discovered by project managers like the one in the opening narrative, the collateral duty of generating statements of work, justifications, and the other documents vital to moving the procurement process forward could consume a great deal of time, possibly even jeopardizing timely contract awards.

Motivated by the rapid-improvement event findings, IHDIV elected to establish an Engineering Liaison Office chartered to take over the extensive pre-award activities that had pre-

viously drained technical professionals' resources. Rather than training a new customer every time the requirement for a new contract vehicle emerged, IHDIV leadership reasoned, why not set up a small liaison office—one that could specialize in preparing procurement data packages and realize great efficiencies—for everything from routine task orders to complex, multimillion-dollar contracts? Indeed, since the ELO was established in the autumn of 2006, it has proven to be a win-win solution for all players in the acquisition process.
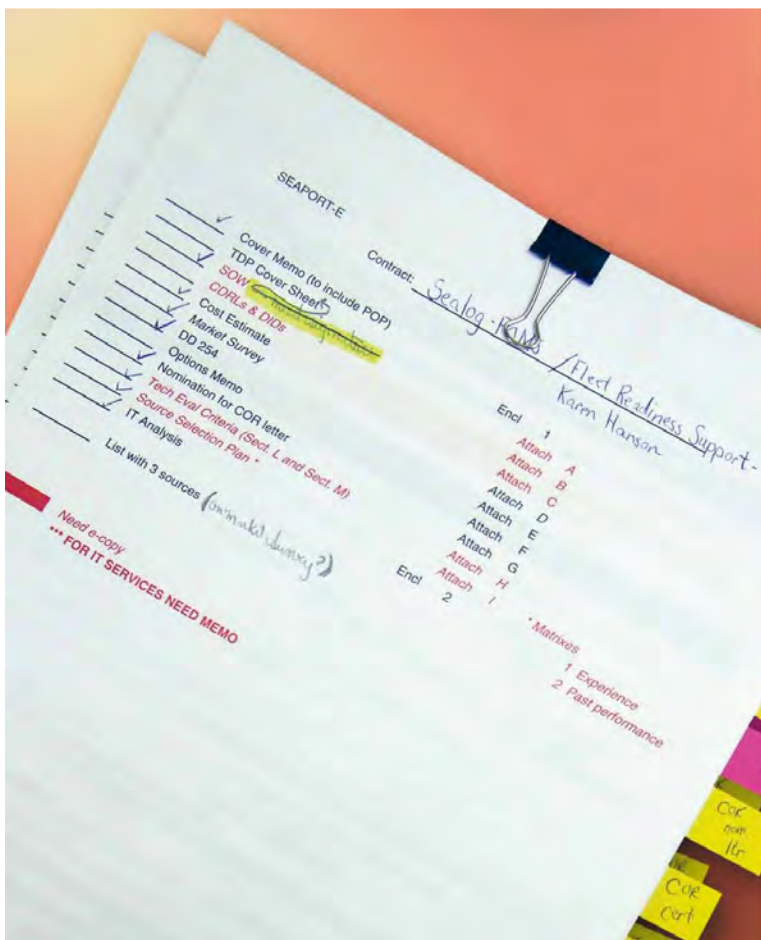
"The ELO, composed of just four full-time equivalents, has had a wonderful effect. The first-pass accuracy of the procurement data packages has gone from about 37 percent to as high as 97 percent. We've also reduced the time to do procurement actions, and we estimate that we've saved more than $1.7 million in procurement costs. That figure captures only the labor savings from the Procurement Department. We've probably saved at least that much more in scientists' and engineers' time," said Dr. Robert V. Gates, the technical director at IHDIV.

That $1.7 million savings figure is impressive. According to ELO's team lead, Michele Gilroy, and her staff, the figure was calculated using the "band 3" National Security Personnel System rate—which is the composite billing rate for administrative professionals such as contract specialists—and multiplying it by the number of hours saved during the pre-award period for all of the procurements they handled. It should be noted that the analysis was performed only for the procurement functions and reflects procurement hours saved. It does not include engineering (customer) hours saved; and according to Gilroy, those cost savings are likely at least as much and probably more.

What follows is an overview of how the ELO conducts its operations. The information was pulled from interviews from Gilroy and her staff, who willingly shared their experiences and recommendations.

A Close-Knit Team

Buy-in from the Procurement Department was essential to getting the ELO successfully launched. The head of the Procurement Department and three of her procuring contracting officers were part of the rapid-improvement event team, and they identified the need for help. During the rapid-improvement event, there was a conscious decision made by all participants to keep the ELO separate from the Procurement Department, and to have the office perform in a true liaison role.

Although a separate organization, the ELO must still keep the Procurement Department apprised of ELO projects and upcoming requirements so the department can anticipate future workloads. The ELO works with the Procurement Department on a daily basis, as the procuring

Balancing the often-competing values of project managers and contracting professionals is a challenge common to many organizations.

contracting officers are the recipients of the packages the ELO prepares for the customers. Both offices are located in the same building, which makes communications more convenient; and they share management databases and tracking sheets, which allows both the Procurement Department and the ELO to track who's doing what and report the information back to the customer. Additionally, ELO staff members attend training and policy update meetings with the Procurement Directorate. The two teams are very close-knit.

The ELO's working relationship with the procuring contracting officers is very important, as Gilroy pointed out. The procuring officers can exercise discretion, and individual preferences do exist with respect to the documentation; however ELO staff members work with the officers and fulfill their needs, adapting as necessary.

How it Works

ELO's customers come mainly from repeat business and word of mouth, and the Procurement Department also directs customers to the office. Once a customer requirement is confirmed, ELO representatives sit down with the appropriate customer representatives and determine what needs to be done.

Typical activities for ELO include generation of the independent government cost estimate, conducting market research, ascertaining salient characteristics (for a competitive buy) and obtaining estimates from vendors, writing statements of work, refining source selection plans, and editing justifications and authorizations. Contract review boards are no longer held at IHDIV, so the ELO also interfaces with legal counsel on many of the matters formerly discussed in that forum.

When the ELO staff conduct market research, they look at sources such as the U.S. General Services Administra-

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>
> **Dr. Robert V. Gates, Indian Head Division technical director**

tion Advantage for labor rates and the nature and availability of supplies.

"We try to promote full and open competition by looking for additional sources based on our market research," said Gilroy.

The ELO and the Procurement Department train their customers to create effective proposal evaluations and source selections. It's very important to invest solid effort on the front end; this makes all proposal evaluation processes easier, according to Gilroy. "We only get involved in proposal evaluations or source selections when we are the contracting officer's representative for the resulting contract," she added.

Gilroy and ELO employee Susan Simpson serve as CORs for on-station-supported contracts (i.e., those that benefit the base as a whole, such as test support, comptroller and administrative assistance, and environmental support). Duties include contract modification requests, liaison meetings, contractor assistance, invoice certification, etc. The COR duty is very case-dependent.

The ELO is funded by a service cost center, which can lead to the perception that it is a "tax." However, all programs that contract out for goods and services are subject to service cost center charges, and not just those that use ELO services. The cost is nominal—just 1.1 percent of the number of dollars obligated. The ELO's staff is partially funded by that 1.1 percent fee, which would be charged whether the ELO's services were used or not. The fee also supports legal counsel, the comptroller, the Defense Finance and Accounting Service, and many other services. Each year, the ELO provides input to the Procurement Department when they are preparing their budgets, and as a result, the percentage may vary slightly from year to year.

There was some resistance to the ELO initially. Change is always a challenge, Gilroy acknowledged; however, most of the scientists and engineers quickly came to recognize the ELO's value, particularly with its ability to rapidly get large contracts under way.

Lessons Learned

ELO-type arrangements are also in place at the Naval Surface Warfare Center-Panama City Division and the Naval Surface Warfare Center-Crane Division, Ind. Representatives from Crane have visited with IHDIV to compare functions and obtain lessons learned.

When asked what advice she would offer to a large DoD organization interested in emulating the ELO model, Gilroy responded, "Although we know DoD contracting thoroughly, every day brings changes and challenges. It's important to have reachback capability. If you can go back to your files and find a purchase or procurement with requirements similar to the new one that just landed on your desk, you can streamline the whole process considerably. Whether you are conducting market research, developing contractual documents, engaging in a broad ordering agreement, or structuring options on a major contract, make sure that your management database provides enough visibility to guide you to the histories of those similar buys, to the competition environment, to past performance data, and to the contract specialist's files if necessary. Not only can you learn from the pre-award documentation prepared for similar procurement, but you can also learn to avoid some of the pitfalls that may have been encountered in previous contracts."

NOTE: In May 2009, eight individuals involved in the establishment and operation of the ELO at IHDIV received a Continuous Process Improvement Award from the Naval Sea Systems Command for promoting collaboration and innovative teaming arrangements that culminated in tangible improvements in cost, quality, and process time.

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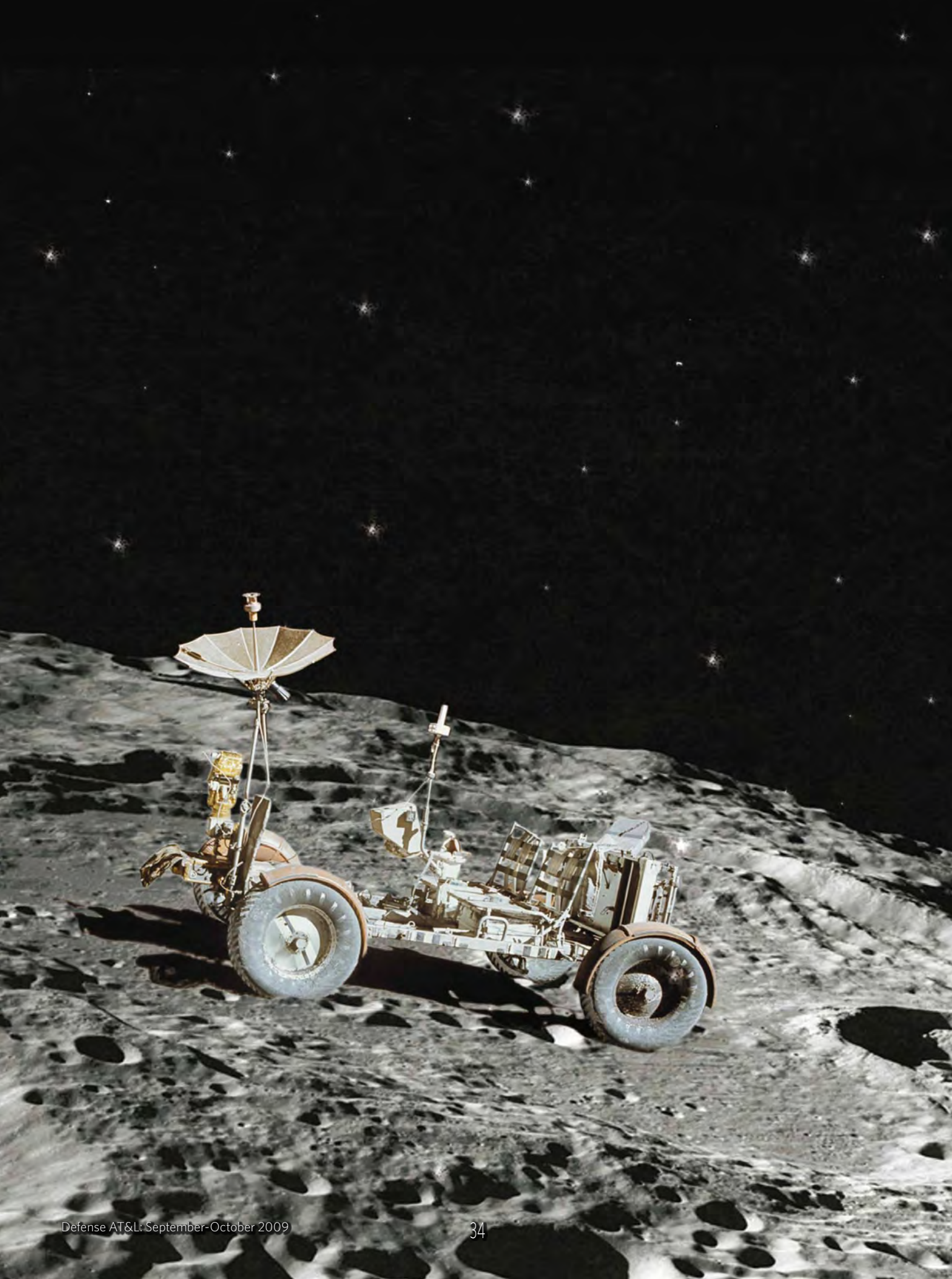
Project Apollo Lights the Way for Acquisition Success

Joe Moschler ▪ Mike McGhee ▪ Jerome Collins ▪ James Weitzner

I t has been just over 40 years since the fulfillment of President John F. Kennedy's goal of "landing a man on the moon and returning him safely to the earth." As we reflect on this technological triumph, we find numerous examples of acquisition best practices and lessons learned, many of which are manifest in our current DoD acquisition management system. From its earliest stages, the U.S. space program pioneered and implemented many innovative ideas and best practices—often out of necessity—and many of those ideas have evolved and are now common tenets of today's defense acquisition practices.

Project Apollo

In the early days of the space race, a new program, named Project Apollo, emerged as America's way to the moon. A developmental effort from the boosters up, Project Apollo initially had two major manned sub-systems—the Command and Lunar modules—and eventually gained a third sub-system called the Lunar Roving Vehicle, or Lunar Rover for short.

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The Command Module was designed to carry a crew of three astronauts into orbit, then eventually return them safely through a fiery reentry and splashdown in the ocean. Prior to being launched, it sat atop a huge three-stage rocket that stood nearly at 363 feet—58 feet taller than the 305-foot Statue of Liberty—and had a diameter of 33 feet. The Lunar Module was located two stages below the Command Module on the rocket. It was a relatively fragile ship, with a cabin barely larger than the combined volume of two telephone booths. It provided adequate room for two pressure-suited astronauts, and no more. Its walls were about as thick as several layers of aluminum foil, and it was incapable of withstanding reentry into Earth's atmosphere.

Non-Developmental Items

The creation of the Command and Lunar modules and the Lunar Rover began with the Soviets' successful launch of Sputnik, the world's first manmade satellite. The National Aeronautics and Space Administration was desperate to respond to that achievement, and as a result, the organization resorted to what today we would call a non-developmental item. NASA started the Mercury and Gemini programs, which were the United States' first tentative flights into space, using existing inter-continental ballistic missile boosters and technologies from the Redstone, Atlas, and Titan missile programs. NASA engineers made reliability and safety modifications to the missiles so human life wouldn't be endangered by their use.

The nation's reputation as a world power was riding on this non-developmental but still cutting-edge technology. That same cutting-edge technology provided the foundation for the United States' early research, testing, and demonstration procedures and processes, such as ensuring a spaceship could rendezvous and dock—necessary steps in the United States' quest to win the race to the moon.

Cost and Risk

Today, we routinely cite cost as an independent variable while concurrently trying to balance schedule and performance as dependent variables; and NASA found balancing independent and dependent variables equally as difficult as we do today. President Kennedy set a schedule of "this decade" [*the 1960s*] as the independent variable. NASA soon came to realize the hard way—what we, in many cases, have yet to recognize today—that there is a fundamental law of acquisition: Program cost, schedule, and performance risks are inversely proportional to the respective weighted relative importance of those same variables. Therefore, if an accurate program estimate exceeds the set limit for the independent variable, then the risks for one or both of the other two dependent variables will be elevated beyond established acceptable limits.

The prime example of that fundamental law in the Apollo program was the tragic launchpad fire of Apollo 1, killing astronauts Gus Grissom, Ed White, and Roger Chaffee. Fol-

lowing that tragedy, NASA coined the term "go fever" to describe what happens when schedule is permitted to reign supreme at all costs. Echoing that same sentiment, we say these days, "If you want it bad, you get it bad."

In the Apollo program's rush to meet schedule, acceptable performance risks were exceeded. Then, as now, the response was the necessary redesign and rebaselining of the program. Following that loss of three lives, NASA spent two years and millions of additional dollars to get back on a course for the moon with a totally redesigned Apollo capsule.

Managing the Pace of Change

Another initiative evident in Project Apollo that applies to today's acquisitions is the idea of design freeze to stem requirements creep—and that happened with the Lunar Module. NASA engineers correctly recognized that effective manufacturing planning and implementation could not be achieved with a constantly changing configuration; however, some design modifications were still necessary after the design was frozen. Those changes required rigorous reviews and prudent control. The risks associated with the delicate balance of making design modifications became apparent in the fifth Lunar Module manned flight, when it was discovered the onboard carbon dioxide scrubbers were not standardized with those onboard the Command Module. That almost became a fatal oversight, but was fortunately identified and overcome by creativity and ingenuity. The idea of design freeze and configuration control was clearly an early precursor to what today we call configuration steering boards.

Expanding Our Capabilities

One well-known but seldom-studied system from Project Apollo is the Lunar Rover. Taking some literary license, we can see how the evolution of that system best illustrates the logic and utility of our current defense acquisition management system.

Early on in the Apollo program, Director of NASA's Marshall Space Flight Center Dr. Werner von Braun and NASA engineers and scientists knew they wanted to be able to explore the lunar surface beyond the immediate landing sites—there were limitations as to how far an astronaut could explore on foot. Just as the Joint Requirements Oversight Council now validates DoD requirements, NASA implemented a process to study and evaluate the capabilities necessary to meet their requirements. This work was similar to what we in DoD now refer to as a capabilities-based assessment. Von Braun and his staff were convinced of the practicality of the idea and developed a plan to pursue a materiel solution; and in today's terms, an initial capabilities document was born. With the equivalent of an approved initial capabilities document in hand, a materiel development decision was also approved and an initial materiel solution analysis was begun.

Evaluating the Options

A primary activity during the materiel solution analysis phase is to conduct an analysis of alternatives, which analyzes operational effectiveness, suitability, and life cycle costs of the alternatives that satisfy the established capability needs. However, the decision to begin the materiel solution analysis phase does not mean that a new acquisition program has been initiated.
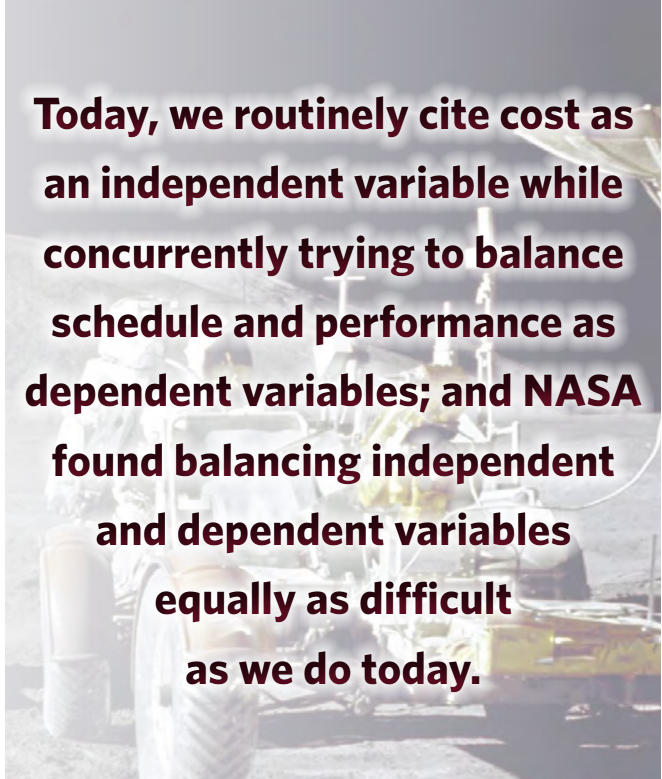
Because of the lack of understanding of what kind of terrain a lunar vehicle would encounter on the moon, many types of locomotion were considered, including an Archimedean screw device, a wide range of wheel types, and track designs. After the 1962-3 unmanned lunar probes provided more detailed data about the moon's surface, scientists and engineers were able to make some design decisions.

NASA's initial concept for the Lunar Rover vehicle was a self-contained version that could transport two or three astronauts and provide sufficient living space for up to a two-week excursion on the moon. It soon became evident that a vehicle for such a mission would weigh approximately 8,000 pounds and would require a dedicated Saturn launch rocket (meaning it couldn't travel with the Command and Lunar modules). NASA quickly realized that the cost and complexity of that plan were not acceptable, and subsequently revised their plans.

As previously stated, the intent of the material solution analysis phase is to determine what solutions should be pursued or developed, if any. In the case of the initial Lunar Rover program, the materiel solution analysis process worked as expected, eliminating unfeasible options. In fact, none of the technologies investigated warranted further pursuit because of mission constraints. In particular, the alternatives considered were not realistically achievable because the costs associated with transport to the moon were too high in terms of tradeoffs and actual dollars.

One of the primary participants considered in the initial analysis was General Motors, and the company was determined that if there was to be a car on the moon, they were going to make it. They were willing to invest corporate funds to realize that vision, and their dedicated and innovative engineering team began to ask questions. What could be transported on the existing Lunar Module? What size? What weight? They learned there was a wedge-shaped bay onboard the Lunar Module that was available to carry a small Lunar Rover.

The allotted cubic space and weight restriction would be critical design factors for the vehicle. Such a vehicle would not support the two-week excursion originally envisioned by NASA, but it would allow the astronauts to venture beyond their limited walking range. After two General Motors engineers demonstrated an ingenious prototype to von Braun, NASA decided to proceed once more with developments for a Lunar Rover. In a classic example of capability tradeoffs,

Today, we routinely cite cost as an independent variable while concurrently trying to balance schedule and performance as dependent variables; and NASA found balancing independent and dependent variables equally as difficult as we do today.

NASA reduced the requirements for the Lunar Rover from a vehicle that could transport two or three astronauts for a two-week journey to one that could simply extend the astronauts' range on the moon and could be transported on the Lunar Module.

Maturing and Prototyping the Technology

With the benefit of hindsight, we would now say that NASA was entering what the defense acquisition community calls the technology development phase. The Lunar Rover had already made a long journey up to this point—but the journey was only just beginning. Although General Motors had developed an innovative and promising design, that did not guarantee them the contract award. NASA conducted full and open competition for the Lunar Rover contract.

Grumman Aircraft Engineering Corporation, the builder of the Lunar Module, entered a prototype that was a strong contender. It was a close competition, and Grumman very nearly won the bid with a design featuring conical wheels that could be removed and stowed together to save space. Grumman's design also had the capability to be remotely operated from Mission Control, even after the astronauts had returned safely home. But in the end, the ease of deployability was the deciding factor, and General Motors (partnered as a major subcontractor under Boeing), won the bid. Like a detachable Murphy bed with wheels, the General Motors design featured spring-loaded hinges that allowed for minimal exertion of the astronauts' energy and time—it literally sprang out of the cargo hold. Although the Grumman design featured somewhat more robust performance characteris-

tics, it also required a substantial amount of time and energy to assemble—resources that were just not available based on the limited supply of consumables.

Once the competitive prototypes were evaluated, a contract was awarded to the General Motors Defense Research Labs—although Boeing was the prime contractor, the design was General Motor's baby. What we today call the engineering manufacturing and development phase began. The hard part was yet to come—actually building a vehicle that would fit onboard the Lunar Module and operate on the lunar surface once it arrived. Engineers faced the task of reducing technology risk through the maturing of critical technology elements. Additionally, the team had a very aggressive schedule of delivering the Lunar Rover—it had to be delivered in just 17 months if it was to be incorporated into Apollo 15.

From the onset of the program, deployability and weight were the two attributes of the Lunar Rover considered critical to the operation of the system. Today, we would call them the key performance parameters for the system. If the Lunar Rover could not be stored in the 5x5x5-foot wedge-shaped space in the Lunar Module, then it would not get to the moon. Furthermore, if the astronauts were not able to easily deploy the Rover once they arrived on the moon's surface, it would be of little value.

Because the Lunar Module hovered over the moon's surface looking for a spot to land, weight of the vehicle was critical. Every ounce of additional weight carried meant a decrease in the available hover time for the Lunar Module pilot to find a suitable spot to land. Therefore, the Lunar Rover's maximum weight, or threshold, was set at 400 pounds. Of course, there were other key system attributes that had to be considered, such as reliability.

Some of the technology development efforts General Motors undertook included developing a battery that both weighed less than 10 pounds and could dissipate heat during operation, capitalizing on the properties of wax to ab-

From the onset of the program, deployability and weight were the two attributes of the Lunar Rover considered critical to the operation of the system.

sorb the heat while in operation and then cool and dissipate that same heat when the Rover was not running. Another technology issue was that the dust on the moon adhered to everything it touched, so the engineers and scientists had to develop a wheel capable of shedding dust so it wouldn't build up on and around the hub and brakes. Their successful approach to that challenge resulted in a wheel constructed of woven piano wire.

The Rover in Action

The engineering manufacturing and development phase ended on schedule after 17 months, with delivery of the first Lunar Rover to NASA on March 10, 1971. The Lunar Rover was first used on July 31, 1971, during the Apollo 15 mission. The mission wasn't without problems, however. Once deployed on the moon, the Apollo 15 crew experienced problems with the front-wheel steering. Fortunately, the Lunar Rover also had rear steering, so the mission could continue. Thus, as that experience proves, even if significant developmental testing and operational assessments are done on a system, problems still can occur during operational testing on a deployed vehicle.

During the Apollo 15, 16, and 17 missions, the Lunar Rover traversed approximately 56 miles, allowing the astronauts to explore the moon's surface to an extent never before achieved.

Learning From the Past

The significance of the achievements and innovations of the Apollo program, and more specifically, the Lunar Rover program, is not lost over time. Even though the NASA engineers at that time didn't have the structured DoD acquisition management system to guide them as we do now, they still used a very systematic approach to acquiring the Lunar Rover and other Apollo systems. That systematic approach, when applied deliberately, led to great programmatic success for Project Apollo, as the Lunar Rover success demonstrates.

However, as expressed in a recent interview with current U.S. astronaut Heidemarie Stefanyshyn-Piper (captain, U.S. Navy), who flew on space missions STS-115 and STS-126, "The biggest change has been our acquisition strategy. We are no longer in a space race, and cost is a far greater concern."

The same disciplined approaches of the Apollo team members are as valid today, if not more so, than they were 40 years ago. The lessons and principles still apply in the strategic and tactical execution of programs, whether in support of a mission to the moon or providing for the daily support and protection of our troops.

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Books visible in illustration:

Acquisition Policies

Contracting for the Fearless

2009 Edition

Federal Acquisition Regulation

The Courage Imperative

Maj. Dan Ward, USAF

n 2006, the Defense Acquisition Performance Assessment (DAPA) report called for Bold New Ideas and Sweeping Changes. It may be indelicate to say so, but I'm not sure we've seen them happen yet—not in a big way, and not on the scale the report's authors seemed to think necessary.

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Illustration by Jim Elmore

> **"We have concluded that the present system needs 'bold new ideas' and we are recommending sweeping changes to the Acquisition System and all of its processes."**
>
> *Defense Acquisition Performance Assessment Report*

Since that time, we have, instead, seen a continuing emphasis on process-centric approaches to acquisition and relatively minor changes to existing policies.

To be sure, there have been some changes in recent months. The Government Accountability Office (GAO) even complimented the Department of Defense for making progress in some areas. However, revising a few policies to place more emphasis on something we were doing already is not particularly new or bold, nor does it constitute "sweeping changes." These little changes might be good ideas, and they might be helpful—but they don't exactly meet the challenge laid down by the authors of the DAPA report.

The F Word

This got me wondering: Why has the acquisition community not adopted bold new ideas? Why have we not implemented sweeping changes? Why have we been so content to fiddle around the edges instead of driving to the heart? Surely it's not because we can't think of any new ideas—there is no shortage of proposed changes that are Bold, New, and Sweeping. Surely it's not because change is difficult—we do difficult things all the time.

I do not know for certain what is getting in the way, but I suspect that one of the major (and no doubt many) roadblocks is the F word. Fear.

Make no mistake, when it comes to making changes in the way the acquisition community does business, there is much to fear. The fears are reasonable and well-founded. They are understandable and justified. But fear should not

be the driving factor in our decision making. It makes sense to fear bold new ideas, but it makes no sense to allow that fear to hold us back.

For decades, the Defense Department relied on large budgets, long schedules, and huge bureaucracies to deliver complex weapon systems. However successful that approach may have been in the past (a point to be debated elsewhere), its future viability is doubtful. There is a wide consensus that reform is needed. Sweeping change is needed. Bold new ideas are needed. And frankly, that scares the hell out of a lot of people.

Untested ideas often have unintended consequences. That's scary. Change is doubly scary when it involves moving away from ideas based on certainty, control, and predictability and toward a trust-based, people-centric approach. It is understandable and rational to fear the unpredictable. However, the supposed certainty and predictability of the traditional acquisition approach is merely a comforting illusion wrapped in statistical models. The actual outcomes of the traditional approach leave much to be desired.

We Are Our Own Worst Enemy

Defense acquisition is currently guided by a modernist scientific management worldview. It values metrics, processes, and assurances of optimized efficiency. Constraints are avoided, and complexity is pursued. This enterprise is frustratingly unable or unwilling to recognize the role it plays in its own failure. Bottomless budgets, endless schedules, and armies of highly educated technologists applying rigorous scientific methodologies have been consistently unable to deliver top-priority systems like the Crusader artillery, the Comanche helicopter, the A-12 Avenger, the Future Imagery Architecture satellites, the KC-X tanker, the CSAR-X helicopter, the Future Combat System, and ... the list goes on.

We squeaked by on fielding systems like the V-22 and F-22 (neither of which was anywhere close to its original schedule, budget, or performance), all the while insisting that strict processes, formal structures, and tight controls are essential keys to our success. We have consistently overspent budgets by billions of dollars and slipped schedules by decades, all the while whining that if we could just have a little more time and money, we could get it right. The truth is, while unproven approaches are justifiably scary, maintaining the current trajectory leads to entirely predictable failures, which is not much better. Actually, it's probably worse.

It is time to screw up our courage, look reality in the face, and answer some hard questions. What did all our analysis get us? What benefit was there from our formal structures and reviews? Would things really have been better if we'd spent more time and money? Is complexity necessary and inevitable? How many of our scientific predictions, either programmatic or technical, came true on our Big Important Projects?

Let's ask that question again: How many of our scientific predictions came true?

Accurate long-term predictions are an expensive pipe dream. Our current reliance on them is a prime opportunity for change. I suggest a two-part alternative: First, we must require much shorter timelines on projects. Second, we should move away from programmatic predictability and toward programmatic reliability, preferring to trust rather than know, and relying on teamwork rather than paperwork. We should place our bets on small teams of disciplined and talented people to be the source of our success, rather than counting on rigorously defined processes executed by interchangeable "human resources." We should emphasize and reward communication more than compliance, and we should foster creative professional discipline rather than demanding conformity.
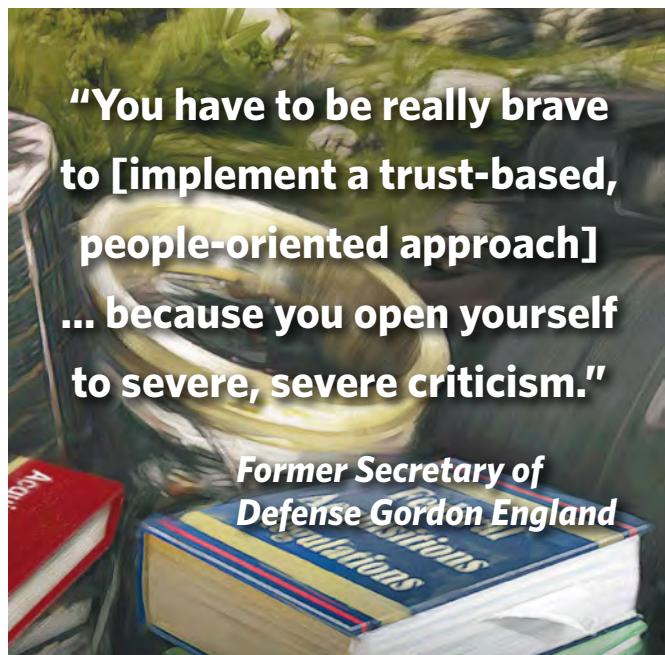
What Are We Scared Of?
Innovation, by its nature, is criticism of the status quo, and many people fear criticism. Bold New Ideas hold within their core an assertion that previous ideas are now inadequate and must be replaced (however meritorious or effective they might have been in the past). But those earlier ideas were the product of actual people—people who are often still in positions of power; positions they have held for a long time and achieved precisely because of their decisions and ideas. And those are the very ideas we are criticizing and offering to replace with our own Bold New Sweeping Changes.

While some people fear receiving criticism, others fear to give it. Too many of us are reluctant to speak up against the Big Programs—which inevitably have powerful, high-ranking patrons—and express ideas contrary to those held by Big Bosses. There is an impression that parroting the party line is expected and rewarded, if not demanded. There is even, in some corners, a belief that people may "speak up but not out," as if the truth were not fit for the light of day and must only be whispered in confidential settings.

Many who see problems are, indeed, reluctant to speak up for fear of being viewed as disloyal or inappropriate. But the dangers of speaking up are often grossly overstated. The truth is, we *can* speak the truth out loud, and we *must* speak the truth out loud. Our fears of painful consequences seldom come true, and even if they do, it's better to suffer for doing the right thing than to be rewarded for doing the

opposite. Silent compliance with things we know are wrong is not admirable. It's cowardly. Yes, speaking up about problems should be done diplomatically, but an excess of discretion and propriety does a disservice to all involved.

The DAPA report bemoans DoD's current "oversight philosophy based on lack of trust." The fear reaction to a trust-based approach is at once real, understandable, justifiable ... and unbecoming. Yes, such an approach may underperform. Yes, it will fail at times. But will it be much worse or more expensive than the current approach? We don't know, and that is scary. But can we afford to not find out? Can we afford to let our fear hold us back? I think not. We can do better if we are willing to conquer our fears. It would be unseemly to do otherwise.

"You have to be really brave to [implement a trust-based, people-oriented approach] ... because you open yourself to severe, severe criticism."

Former Secretary of Defense Gordon England

In testimony before the House Armed Services Committee on June 3, 2009, former Secretary of Defense Gordon England commented on the difficulty of such a trust-based, people-oriented approach. He said, "You have to be really brave to do that, because ... you no longer have the same degree of comfort. [In] my experience, people will shy away from using those authorities, because you open yourself to severe, severe criticism."

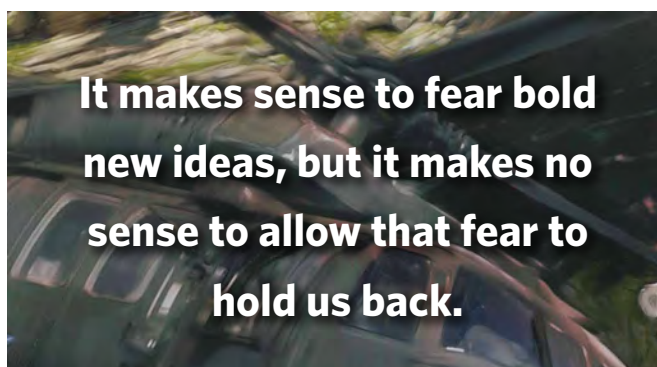In response, Democratic Rep. Jim Cooper of Tennessee pointedly asked, "But, Mr. Secretary, aren't our Services all about bravery?"

There is a well-warranted fear of criticism, fear that one's life work might appear shabby or ineffective. Those aren't unreasonable fears. Change advocates must be sensitive to such concerns. Proponents of innovation, of Bold New Ideas, will always induce a certain amount of fear in the

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defenders and progenitors of the status quo, however much they strive to do otherwise. They must, therefore, move forward gently.

Perhaps influenced by this particular fear, some leaders try to assert—against overwhelming evidence and widespread consensus among objective observers and analysts—that the acquisition process isn't really as broken as some people say; that sweeping changes are unnecessary. They seem to believe that a person who spent a career in DoD is somehow more able to objectively assess his or her own performance and the necessity (or not) for change than an external agent like the GAO.

To be sure, the GAO misses the boat sometimes. Its analysts may not be as completely objective as we would like them to be. They are human and have their own points of view, biases, beliefs … and their own fears. However, a case can be made that GAO personnel still produce a more objective and accurate analysis of the DoD acquisition community than DoD can. Assertions to the contrary carry a significant burden of proof.

> ## It makes sense to fear bold new ideas, but it makes no sense to allow that fear to hold us back.

It's All About Courage
We don't like to think about fear or acknowledge the role fear plays in our decision making. It's scary to be afraid. It's embarrassing. We would rather believe we are driven by nobler motives. We would rather not accept the notion that fear is at the root of our reluctance to change. We must face the reality of fear's presence, nonetheless. Change and uncertainty are fear-inducing, but we should deal with fear by being courageous, by putting service before self, and by working together. Courage is something the military is supposed to know about, as Rep. Cooper reminded us. Courage is supposed to be our hallmark. Let us show our courage when it comes to making meaningful change. Let us start by acknowledging that it's scary, and let us be patient and firm with those whose courage falters.

I suggest that we, the acquisition community, look long and hard at our performance and at the results we actually provide. That we focus on our outcomes and not be content to bask in our compliance with the required processes. Accept the insights and criticisms of outside observers. Accept our own contributions to the current situation and our own culpability for the failures around us. Accept the reality of fear. If this sounds like the beginning of a 12-step program, that's because all forms of recovery have a common need for courage. The fearful, the timid, and the apathetic will never achieve sweeping changes. Those who are satisfied with the status quo will never implement Bold New Ideas nor lead the acquisition community to new levels of performance.

Seeking to cure our ills through a more strenuous application of older solutions or bigger doses of previously ineffective medicines is unlikely to be effective. The DAPA report got it right: We need Bold New Ideas and Sweeping Changes, and we need the courage to see them through.

Brave New Acquisition World
How encouraging, therefore, to see the Air Force's recent Acquisition Improvement Plan (AIP) propose several divergences from our recent glide path. For example, instead of casting process perfection as the foundation of future success, the AIP identifies "trained, educated and experienced people" as the true source of improved performance.

In a huge departure from DoD's traditional preference for large budgets, the AIP boldly opines that "the majority of requirements might be satisfied at lower cost." With admirable honesty, it humbly points out, "In the interest of perfecting the procedures, we allowed the process to become overly complicated." That echoes the DAPA report's observation that "complex acquisition processes do not promote program success—they increase costs, add to schedule and obfuscate accountability." The AIP's explicit embrace of simplicity; its frequently stated preference for low-cost, rapid-development efforts; and its emphasis on people over process are significant—and potentially scary—changes.

Yes, there is much to fear. We might be wrong. Again. We might fail. Again. We might be blamed for past failures, and we might deserve that blame. Again. Along the way, we might make uncomfortable discoveries about ourselves and our ideas, about our incompetence, and about our culpability. Where there is much to fear, the need for courage is great.

As for me, I fear the continual use of methods that didn't work yesterday and are unlikely to work tomorrow. I fear we will continue to be satisfied with making little tweaks and trims around the edges, rather than the sweeping changes we need. I fear we will give in to the temptation to seek personal rewards rather than providing service. I fear the outcome of failing to change our behavior, failing to change our value set, failing to redefine what we reward and what we pursue.

On a more personal note, I fear these very words may hurt some people. I fear they may hurt me. I fear being wrong

By Dan Ward, Chris Quaid, Gabe Mounce, and Jim Elmore

more complexity, and more oversight. I must admit, the weapons we field are world-class and unmatched by any adversary, potential or imagined. Those weapons are the result of the ideas, people, and methods of the past. But as the stock market analysts tell us, past performance does not guarantee future performance, and in the same vein, the GAO's Michael Sullivan stated in his September 2008 testimony to Congress, "DoD is not receiving expected returns on its large investment in weapon systems. … Our work shows that acquisition problems will likely persist until DoD provides a better foundation for buying the right things, the right way." The title of Sullivan's report is *Fundamental Changes Are Needed To Improve Weapon System Outcomes*, and it corroborates the DAPA assessment quite closely.

about all this, because that would be embarrassing. I also fear being right, because that would mean a lot of hard work is ahead of us. And right or wrong, I fear getting negative reactions to such an impassioned expression of what I believe. But even more, I fear the consequences for my character if I do not express these beliefs.

And most of all, I fear lives will be lost because of our failures.

If I am wrong about all this, it should be very easy to demonstrate my error. Just point to the Bold New Ideas and Sweeping Changes that have been implemented across DoD in the years since the DAPA report came out. Point to high-impact examples of successful challenges to conventional thinking. Point to the abandoned policies and approaches of the past. Maybe all these things happened while I wasn't looking, or in times and places I was unaware of. They certainly happened in some places and on a certain scale, but I'm not sure we have quite achieved the level of improvement the DAPA report called for. For that matter, I'm not sure we even got close.

Or maybe the DAPA report was wrong. Maybe what the defense acquisition community needs is more of the same: more process, more dollars, more time, more analysis,

I think the DAPA report and the numerous GAO reports and testimonies are probably correct. I believe things are not as good as they should be, not only programmatically and financially, but also operationally and technically. I believe change is indeed needed—sweeping change, driven by Bold New Ideas. That kind of change is scary, so courage is needed; courage coupled with gentleness and empathy for those whose ideas must be replaced.

I think that if any group of people can summon the courage required to make these changes, it is the U.S. military. Who's with me?

The author welcomes comments and questions and can be contacted at the.dan.ward@gmail.com.

Building a Reliable Product

Army Reliability Improvement Initiatives

Michael J. Cushing ▪ David E. Mortin

The Army is rapidly pursuing new reliability improvement initiatives that support and implement recent Defense Science Board and Department of Defense Reliability Improvement Working Group recommendations. Those initiatives are crucial and are needed now. Army and DoD system reliability values are on a downward turn. Even moderate degradations in system reliability, on the order of 10 percent, equate to billions of dollars in additional costs over the life cycle of a major weapon system. Even more important, warfighters deserve the most reliable and rugged equipment possible. The new Army initiatives will provide an opportunity to improve system reliability, stop the downward spiral, and cost-effectively implement reliability best practices.

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The Army is taking a multi-pronged approach to improve reliability by establishing new reliability test thresholds, evaluating programs early using a new reliability scorecard, developing reliability growth tools, and increasing emphasis on early engineering analyses to positively affect designs during the development process. The Army's initiatives, detailed in this article, can be applied across DoD.

Army Reliability Policy

Under the new Army reliability policy approved in December 2007, an engineering and manufacturing development phase reliability test threshold will be established for all programs with a Joint Requirements Oversight Council joint potential designator of "joint interest." The threshold values will also be incorporated into solicitations for contracts. The policy—currently being added to the next revisions of Army Regulation 70-1, "Army Acquisition Policy," and Army Regulation 73-1, "Test and Evaluation Policy"—includes details for establishing the system reliability threshold. The threshold will be approved as part of the test and evaluation master plan and recorded in the acquisition program baseline at Milestone B. The system will be expected to meet or exceed the reliability threshold at the end of the first full-up, integrated, system-level developmental test event.

Achievement of the reliability threshold will be a major focus during design reviews. If a reliability threshold breach occurs, an in-process review led by the Army Test and Evaluation Command will convene to address:
- The program manager's planning and implementation of corrective actions and associated impacts
- The Army Test and Evaluation Command's assessment of the corrective action plan
- Ownership cost impacts
- System utility impact assessments from the Army Training and Doctrine Command.

The new policy also highlights some of the best commercial and defense reliability practices that programs should use to help ensure that the system reliability requirements will be met. The policy will provide senior Army leadership an earlier warning for those programs that are falling short of critical reliability targets.

Reliability Program Standard

DoD worked closely with both industry and the Government Electronics and Information Technology Association on the development of a new standard: GEIA-STD-0009, "Reliability Program Standard for Systems Design, Development, and Manufacturing." DoD was motivated to initiate and support the undertaking because many systems have not been achieving the required level of reliability during developmental testing and have been subsequently found unsuitable during initial operational test and evaluation. In May 2008, the Defense Science Board developmental test and evaluation task force examined those issues and concluded that a new reliability program standard—which

includes reliability growth as an integral part of design and development, and can be readily cited in DoD contracts—was urgently needed.

GEIA-STD-0009 consists of the essential reliability processes that must be performed in order to design, build, and field reliable systems. GEIA-STD-0009 is, at its core, a reliability engineering and growth process that is fully integrated with systems engineering. In order to facilitate its use in DoD acquisition contracts, enabling sample language was developed; it which can be viewed at the Defense Acquisition University's Acquisition Community Connection Web site, <https://acc.dau.mil/communitybrowser.aspx?id=219127&lang=en-us>.

The sample reliability language consists of four parts:
- Section C, Statement of Work Reliability Language and Tailoring Instructions. If Section C of a request for proposal contains a statement of work, it is recommended that this sample reliability language be incorporated. Embedded tailoring guidance is included in the sample language. If Section C does not contain a statement of work, then it is recommended that a statement be included in the statement of objectives requiring that the sample reliability language be included in the contractor statement of work.
- Section L, Proposal Instructions Reliability Language. Section L of a government contract lays out the specific preparation requirements for submissions.
- Section M, Evaluation Factors for Award Reliability Language. Section M relays the factors used to determine how the government plans to compare each bid and which criteria are most important to them.
- Checklist for Evaluating Reliability Program Plans. The checklist can be used to evaluate draft reliability program plans developed based on the reliability statement of work language.

It is also recommended that GEIA-STD-0009 be explicitly cited in the system specification, which is typically included in Section C of the request for proposal.

Reliability Scorecard

The reliability scorecard examines a supplier's use of reliability best practices and the supplier's planned and completed reliability tasks. The scorecard can also be used to evaluate a given program's reliability progress. The scorecard was developed based, in part, on reliability assessment approaches developed by the Institute of Electrical and Electronics Engineers, Raytheon, Alion, the University of Maryland, and others. The Army Materiel Systems Analysis Activity (AMSAA) and the Army Evaluation Center expanded and refined the individual assessment areas based on several years of evaluation and reliability program experience.

The latest version of the scorecard allows quantitative assessment across eight critical areas:

Great Lessons Learned

I would like to praise Wayne Turk's article "Be Willing to Make Changes," which appeared in the May-June 2009 issue of *Defense AT&L* magazine. It is very timely considering all that is going on in the DoD environment. Not only was the article concise and well-written, but the author hit all the critical points of change management, especially participative involvement, explaining what's in it for those impacted by the change, creating a sense of urgency, and using middle managers to explain the new process and its benefits. Great idea for a checklist!

To quote Woodrow Wilson, "If you want to make enemies, try to change something." That is very true! Hopefully, *Defense AT&L* readers will take advantage of Turk's article to select the right changes to make and implement them well. Too often, managers naively expect that those impacted by the change to embrace it and understand it from an "all-hands" e-mail. Successful change, as Turk points out in his article, takes a lot of planning and work.

I also liked the article "Leaders as Circus Performers," by Fred Jones, Doug McCallum, and Chris Sargent, also appearing in the May-June 2009 issue. The analogy of plate-spinners (high-level leaders) versus jugglers (lower-level leaders) is a good one. I also liked the analysis of the feedback the authors got from previous surveys. Too often, people are asked to respond to a survey, never hearing the results or, more important, never learning what actions were taken as a result of the survey.

The authors also hit the key reasons surveys are not used more often by leaders: ignorance, fear, and skepticism. Hopefully, the article will help leaders overcome those feelings.

Al Kaniss
Naval Air Systems Command

> **The Army is taking a multi-pronged approach to improve reliability, establishing new reliability test thresholds, evaluating programs early using a new reliability scorecard, developing reliability growth tools, and increasing emphasis on early engineering analyses.**

- Reliability requirements and planning
- Training and development
- Reliability analysis
- Reliability testing
- Supply chain management
- Failure tracking and reporting
- Verification and validation
- Reliability improvements.

Each element is rated red, yellow, or green based on a number of questions. Quantitative risk scores are provided for each assessment area as well as for the overall system. This scorecard is important for tracking the achievement of reliability requirements and rating the adequacy of the overall reliability program. The scorecard can be accessed from the Defense Acquisition University's Acquisition Community Connection Web site at <https://acc.dau.mil/community browser.aspx?id=210483&lang=en-us>.

New Reliability Growth Tools and Test Bed

AMSAA has produced several new reliability growth models. One such model is the planning model based on projection methodology (PM2). Many times, analysts will produce system-level reliability growth planning curves that, at first glance, appear reasonable and achieve the desired goals with the given set of input parameters. However, those curves often do not allow for the impacts associated with schedule, testing, refurbishment, and block updates. By not accounting for those very real constraints, the system-level reliability growth planning curves can portray an overly optimistic and unrealistic program for achieving the system-level

reliability. Those constraints could be addressed using older reliability growth methodology, but not in a systematic way.

Planning models can be made more realistic by incorporating some of the methodology used for reliability growth projection, as demonstrated by the PM2 model. The projection methodologies account for key engineering and schedule decisions such as fix effectiveness factor levels, management strategy, delays for incorporating fixes, and refurbishment period scheduling.

The PM2 model starts by determining the reliability testing operating hours, which are officially scored, as a function of calendar time for each individual system included in reliability growth testing. Then for each platform calendar schedule, the blocks of time where corrective actions are implemented (i.e., refurbishment periods) are inserted. Next, an estimate for the average time between the occurrence of a new problem failure mode and when a corrective action can be inserted is applied. The user then develops an idealized growth curve using projection methodology. The user specifies the initial mean time between failure, the goal mean time between failure, the planned value of the average fix effectiveness factor, the management strategy, and the allocated test time. Those five values define the idealized growth curve. The idealized curve gives the expected mean time between failure as a function of test time; and offers a number of highly useful metrics that provide the program manager and other members of the acquisition community with a valuable means to assess the reliability program, testing program, number of assets available, and the availability of engineering resources to maximize the chances of producing a highly reliable and cost-effective system.

The AMSAA PM2 reliability growth planning curve sets a much better expectation for what reliability values should be achieved as part of the system development process. Often with idealized curves, the reliability values are overly optimistic. In many programs, a large portion of the testing hours actually occurs towards the end of the program or immediately before a major milestone. The idealized curve often shows that the desired reliability is achieved by the milestone. However, when actual schedule and corrective constraints are placed on the planned reliability growth curve, engineers and management can see where the real bottlenecks are and better allocate their test time, engineering activities, refurbishment periods, and test assets in order to meet the reliability goal with minimal risk. The model has recently been released in a Microsoft® Excel spreadsheet format and is available to U.S. government employees and defense contractors, who can request access to the model by e-mailing apgr-amsa-reltools@us.army.mil.

Another supporting advance is the new reliability simulation test bed, which examines the potential reliability growth of complex systems. The goal of the test bed is to examine the impacts of various reliability growth strategies on the overall system reliability and the accuracy of associated statistical model reliability assessments. The simulations are conducted by making random draws of initial mode failure rates from several parent populations. The simulation is unique in comparison to others of this type in that it allows for flexibility in implementing corrective actions. The corrective actions may be implemented during the test phase of the system or delayed until the end of the overall test period. When implemented during the test phase, the corrective actions are implemented either through built-in corrective action periods within the overall test phase or during the test periods themselves.

In the near term, existing Army reliability growth models are to be converted to an Excel-based format to allow more DoD personnel and contractors to easily implement the latest in reliability growth modeling without cost.

Physics of Failure
The Army continues to successfully apply physics of failure modeling to a wide variety of vehicles and electronics systems. PoF is a science-based approach to reliability that uses modeling and simulation to design reliability into a product, perform reliability assessments, and focus reliability tests and screens where they will be the most effective and productive. The PoF approach involves modeling the root causes of failure—often called failure mechanisms—such as fatigue, fracture, wear, and corrosion. The basis of PoF is that it is not only important to understand how things work but also, equally important, to understand how things fail. Computer-aided design tools have been developed to address various loads, stresses, failure mechanisms, and failure sites.

PoF modeling has been critical for systems currently supporting Operation Iraqi Freedom and Operation Enduring Freedom. For example, the PoF modeling provided a quick and efficient way to mitigate the weight impacts of new armor packages and maintain system reliability for warfighters.

Increasing Weapons System Reliability
The initiatives discussed in this article are just some of the ways that the Army is working to further increase weapons system reliability. These initiatives are cost-effective and will provide significant returns on investment—and even greater benefits for our warfighters.

U.S. government personnel and their DoD contractors interested in obtaining, at no cost, reliability growth models, the reliability scorecard, or associated training can send an e-mail request to apgr-amsa-reltools@us.army.mil.

The authors welcome comments and questions and can be contacted at apgr-amsa-reltools@us.army.mil.

Questioning Uncle Sam

The Rise of Contracting Problems

Jaime Gracia

Federal discretionary spending, along with other federal policies and programs, will be facing serious budget pressures stemming from new budgetary demands and demographic trends in the coming years. Exacerbating this trend is defense spending, which falls within the discretionary spending accounts. Current military conflicts in Afghanistan and Iraq are consuming a large share of Department of Defense resources and are causing massive logistical pressures because of wear on weapons and equipment. Restoring or replacing equipment sooner than planned will put further pressure on DoD investment accounts.

Overall, trends in federal contracting indicate that DoD will have difficulties meeting its needs, all while having fewer resources available. Indeed, federal procurement, especially within DoD, has come under increased scrutiny. Exacerbating the scrutiny of contract actions is industry's focus

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on keeping or preventing a shrinking market share of DoD's contracts, resulting in protest actions being used as an industry's business strategy.

Protesting as a Strategy

If the past year is any indication, the government will face an uphill climb to complete its acquisition mission. According to Donna Borak in her article "Federal Contract Protests Hit 10-Year High in 2008" (*AP*, Dec. 30, 2008), more protests were filed in 2008 to challenge federal contracting decisions than in any year during the past decade. That is a sign of more companies competing against one another for smaller shares of a shrinking market for multibillion-dollar projects. As a result of poor source-selection practices and award decisions, the government opened the door to opportunities for protests. Losing bidders lodged protests of more than $70 billion on defense contract actions alone. Contractors filed more than 1,600 protests in 2008, a 17-percent increase over 2007 and the highest level since 1998, according a Dec. 22, 2008, annual report released by the Government Accountability Office (GAO-09-251R). With multiyear deals at stake and a likely downturn in defense spending, companies are using protests as a strategic weapon to ensure they remain viable.

Factors that have contributed to the increase in protests vary, but arguably the most definitive factor has been Congress's decision to allow companies to dispute task orders on major contracts in addition to other recent changes allowing expanded protest action. However, when protests filed under those changes are removed from the count, the total number of protests still rose by 11 percent from last year, according to Robert Brodsky in his June 20, 2008, *Government Executive* article "Large Task Order Contracts Now Open to Protest." According to industry analysts, companies are determined to ride out a federal spending downturn with as many contract wins as possible, which creates a protest-rich environment.

The fallout from such failed efforts has emphasized the gap in leadership by contracting officials and the necessity for reform in federal contracting. Issues include the failure of agencies to follow their own procurement rules, the lack of clearly stated requirements, and overall negligence of acquisition leaders in overseeing the procurement process—all of which has led to protests being backed by government auditors. One of industry's key concerns is the lack of information provided by the government at any point during the contract-ing process. That lack of transparency often prompts companies to protest in order to get as much data as they can, delaying contract actions and ultimately making the government and the warfighter pay the price for such cumbersome and poorly executed contract actions. What follow are examples of contract processes that had critical problems.

Lack of Oversight

"Alliant is a $50 billion, 10-year government-wide acquisition contract that federal agencies were supposed to begin using in 2007 to buy an array of information technology services," Gautham Nagesh reported in the article "Alliant protest upheld, contract placed on hold," published in *Nextgov*, March 6, 2008. Alliant and a related government-wide acquisition contract for small businesses are the successors to two General Services Administration (GSA) contracts: ANSWER (Applications 'N Support of Widely-Diverse End-User Requirements), which expired in December 2008; and Millenia, which expired in April 2009.

From the beginning, industry criticized the Alliant contract process for its lack of transparency. GSA withheld the requests for proposal (RFP) for an extraordinary long time, which had the effect of driving up bid and proposal costs to the point that some companies did not consider Alliant to be worth the investment. Industry also had an issue with the RFP's instructions about documenting companies' past performance, which along with the basic contract plan, was considered more important than price. Although how well companies executed other government contracts was a key evaluation factor, the RFP did not adequately allow the opportunity for companies to present their past work in their proposals. As a result, the contractor evaluation process was unclear, and that created complications.

Another problem was that because of GSA's failure to provide adequate resources, ensure accountability, and follow established procedures for the source selection, the Alliant award was effectively outsourced to Calyptus Consulting Group. The firm was tasked to check references and research the past performance of contract bidders, which is considered inherently governmental work. Although it is not unusual for contractors to act as advisors and assist the government with source selection, GSA allowed Calyptus to have overall responsibility for the process. GSA further failed to perform quality assurance actions to ensure that Calyptus' work added value to the selection process.

Further breakdowns in GSA's processes occurred when it was determined that Calyptus, at the time of the Alliant award, had two of the contract winners as clients. GSA failed to identify potential conflicts early in the contracting process and ensure there were no organizational conflicts of interest. According to the Federal Acquisition Regulation, an organizational conflict of interest can be the result of an actual or potential conflict that might impair the objectivity of a contractor's judgment. If a conflict of interest is found, agencies must work with contractors to set up firewalls that will ensure objectivity and protect the interests of the government in the procurement process. However, it is unclear whether GSA set up those firewalls or attempted to prevent any appearance of impropriety or favoritism.

As reported by Nagesh:
> Sixty-two companies submitted bids for Alliant, and 29 were selected as service providers on July 31 [*in 2007*]. Following the contract award, eight companies filed protests arguing that the evaluation process was arbitrary and contrary to the law. [*A decision released by*] Judge Frances M. Allegra of the U.S. Court of Federal Claims upheld the protest, stating that GSA attached "talismanic significance to technical calculations that suffer from false precision" and the agency "made distinctions that, in their own right, likely were arbitrary, capricious and contrary to law, but certainly became so when the agency failed adequately to account for price and to make appropriate tradeoff decisions." ...

> ... Allegra noted that given Calyptus's lack of familiarity with ratings scales and the Alliant procurement, it was hardly surprising that the answers received did not provide much useful information. As evidence, she wrote, "more than one reference simply responded 'very good,' 'very well' or 'very effectively'... It was left to the evaluators to extrapolate a rating out of these two-word descriptions."

The end result, Allegra ruled, was that GSA relied on faulty data when awarding its contract. Allegra prohibited the agency and its contractors from performing any work related to Alliant, and she ordered the agency to consider price and price reasonableness in all future Alliant awards.

After more than three years, the Alliant contract was finally awarded in March 2009 to virtually all the companies that originally submitted bids. According to GSA officials, a major part of the revised strategy was to make absolutely sure there were no major grounds for challenge. Therefore, the strategy evolved to forgo limiting awards to a pre-set number of companies and to evaluate renewed bids based on technical capabilities, past performance, and pricing—all based on negotiation and allowing vendors to improve their proposals such that all would be acceptable.

As a result, Alliant appears to have veered from GSA's earlier vision of selecting the best in class to possibly lowering the bar for quality. Of note is that the current contract award means more work will be involved with a larger pool of competition for task orders. In addition, because large contracts like Alliant are difficult to structure, the likelihood of mistakes being made—and protests being successful—is greater. And that makes the option of a bid protest possibly more attractive to a losing bidder. Task orders for individual sections of the Alliant contract were being worked for release as of this article's publication.

Aerial Refueling Tanker Protest

The Alliant procurement is one of the most glaring examples of the problems that can occur when oversight of contract processes is inadequate. The acquisition of refueling tankers by the Air Force, the KC-X program, is an example of the significant issues with defense procurement and the inherent problems across government with large-scale acquisitions and the infringement of political pressures on the acquisition process.

The KC-X program became a winner-take-all contract, as the awardee would likely be charged with replacing all 530 tankers in the Air Force fleet—a contract valued at more than $125 billion, including logistics, parts, and maintenance. However, the true strategic value was an economic cushion that would protect the winner for decades in the event of a downturn in the highly cyclical market for commercial aircraft. With the award, the Air Force would become the largest customer for either Boeing or Northrop/EADS, keeping a production line running at full capacity well into the foreseeable future.

Analysts expected the losing team to protest the decision, as each team had developed a core constituency in Congress, where members' states stood to gain jobs; however, the actual award and subsequent protest triggered an alarming series of events indicative of a broken system, exacerbated by poor oversight and governance at the highest levels.

After receiving proposals and conducting numerous rounds of negotiations with Boeing and Northrop/EADS, the Air Force selected the Northrop/EADS proposal for award on Feb. 29, 2008. On March 11, 2008, Boeing filed its protest with GAO. After an extensive review that included hearings, GAO concluded that the Air Force had made a number of significant errors that prejudiced and ultimately adversely affected the outcome of what was a close competition between Boeing and Northrop/EADS. Errors identified by GAO included not assessing the relative merits of the proposals in accordance with the evaluation rules and criteria identified in the solicitation, not having documentation to support certain aspects of the evaluation, conducting unequal and misleading discussions with Boeing, and having errors or unsupported conclusions in the cost evaluation. Accordingly, GAO sustained Boeing's protest, thus demonstrating the Air

Force's failure to provide proper oversight and guidance on one of the biggest contracts ever awarded by DoD.

As a result of the GAO decision and an unprecedented public relations campaign dubbed "Tanker Wars" by the bidding firms and their respective allies on Capitol Hill, the Pentagon canceled the competition. U.S. Air Force Chief of Staff Gen. Norton Schwartz told reporters that a new contract for an aerial refueling aircraft could be awarded within eight to 12 months once the new presidential administration decided how to proceed, but, he said, it could take as long as 36 to 48 months. The conclusion is that the process for acquiring major systems continues to be a difficult and challenging process, with the final result being continual waste, fraud, and abuse, and subsequent operational failures. Warfighters continue to have their needs unmet, and that exacerbates their difficulties in completing their respective missions.

Creating Better Acquisition Outcomes

As the Alliant and KC-X programs demonstrate, government organizations fail to apply the necessary discipline and controls or assign much-needed accountability in the contracting process. The result is poor outcomes. The failure to use knowledge-based acquisition techniques (for example, creating a procurement process that is incremental, manageable, and predictable) results in the inability to measure progress in meeting cost, schedule, and performance goals. The result: fraud, waste, and abuse in a time of diminishing resources and operational failures. Overall, federal acquisition leaders, specifically those in DoD, continue on a path that leads to protests, poor discipline, and weak businesses cases.

Acquisition leaders must foster a disciplined environment for making decisions that will lead to better program choices and better outcomes. In GAO-06-800T, released Sept. 6, 2006, GAO recommended many times the establishment of such an acquisition environment, but leaders still have not taken the necessary steps to realize that environment because of lack of political will and weaknesses in acquisition workforce numbers. If the acquisition process is to be fixed and acquisition outcomes are to be improved, GAO's recommendations must be implemented:

- Constrain individual program requirements by working within available resources and by leveraging systems engineering
- Establish clear business cases for each individual investment
- Enable science and technology organizations to shoulder the technology burden
- Ensure the workforce is capable of managing requirements, source selection, and knowledge-based acquisition strategies
- Establish and enforce controls to ensure appropriate knowledge is captured and used at critical junctures before moving programs forward and investing more money.

The announcement by Secretary of Defense Robert M. Gates to fill 30,000 acquisition positions by 2015 has put pressure on senior leaders to move quickly to confront the growing crisis if the federal government is to execute the acquisition mission. In responding to the challenge, acquisition leaders must take responsibility for timely actions to improve fiscal economies, managerial controls, and acquisition outcomes. Managerial actions must have the long-term effect of providing better policies, structures, and processes to use resources more efficiently and achieve effective outcomes. These changes must take place soon if the federal government, most notably DoD, is to improve the current environment of poor oversight, ineffective management, and the inability to acquire the goods and services needed to complete the mission. The current environment has led to a situation in which contract awards are delayed or canceled because of the inability to execute business needs with personnel hiring goals based on numbers and not capabilities. A coherent acquisition workforce strategy will be one of the critical reform areas that must be implemented correctly and quickly if we are to begin to see positive impacts to the acquisition mission and bring the DoD back in line as a good steward of taxpayer money.

Setting the right conditions for successful acquisition outcomes is imperative if acquisition leaders are to fix the system. GAO continues to examine how to bring discipline to DoD's requirements and budgetary process and the role played by the program manager. Ultimately, acquisition leaders must identify the acquisition objectives and goals and then provide the proper oversight and accountability to focus on effectiveness. Also, the process must consider vendors as stakeholders in the process. Having open communications with industry is vital to ensuring fair, honest, and proper solicitations. More important, open communications will help ensure the government receives best value and will offset protests by creating transparency in the process.

Acquisition problems will likely persist until government leaders make tough decisions as to which programs should be pursued or not pursued; ensure that programs can be executed; lock in requirements before programs are started; and make it clear who is responsible for what and hold people accountable when they do not fulfill their responsibilities. Providing the needed oversight and adherence to established policy is one strategic mission that leaders must embrace for better outcomes. Although the solutions will be difficult, acquisition leaders must view the issues facing the federal acquisition system holistically, focusing on integrating acquisition into the agency's overall mission. It is imperative that leaders tackle the critical issues facing the procurement system if the problems facing government management are to be addressed.

Effective Delegation
A Win-Win Strategy

Wayne Turk

S ome people think that delegation is having subordinates do what the manager doesn't want to do. No, that isn't delegation; it is shirking your duties. Okay then, so what is delegation? Delegation is the process of giving decision-making authority and/or the responsibility for completing certain tasks to lower-level employees. The tasks that are delegated are usually management-level tasks and should be delegated for a better reason than "I didn't want to do it myself."

Why are some managers leery of delegation? There's the rarely true but widely held belief that if you want it done right, you have to do it yourself because, after all, the final responsibility for successful completion of a task lies with the manager. There are other reasons that managers don't delegate: not understanding the benefits of delegation, no trust in their subordinates, fear of being seen as lazy, reluctance to take risks, feeling that it would be quicker to do it yourself than taking time to explain the task to someone, and fear of competition from subordinates. The last is

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especially true. Many managers are afraid that if they train a subordinate too well, he or she will get promoted and they will lose him or—even worse—take the manager's own job. And some mangers just lack the competencies or are afraid that they lack what it takes to delegate effectively. They may have chosen the wrong tasks to delegate or the wrong person to trust in the past. They may lack the communication skills and/or the time to provide adequate direction to the subordinate when delegating.

Why Delegate?

So why should you delegate? I can come up with a half dozen reasons quickly. There are probably more that you can add.

You relieve yourself of some of your duties. This gives you more time to spend on other tasks, allowing you to do a better job and ultimately to take on more advanced tasks that will prepare you for future opportunities when they become available. It also may give you more time to work on new projects or ideas for improvement in your area.

When you delegate, you create a team that gets more accomplished in a shorter time. Time is almost always in short supply, especially if you are working on a project with a specified schedule.

You lower your stress level. You identify tasks that can be accomplished by others on your team. It's a great way to develop their skills, and, by handing off some of your tasks to your people, you will lower your stress level during the workday and go home at the end of the day satisfied that your team accomplished more.

Delegation creates motivation. When you delegate tasks that help others increase their experience and capabilities, they are more motivated because they see that you trust them to get the job done. When your people are motivated, they may take more initiative to get the delegated tasks done better, as well as their other work; create more innovative solutions; have higher morale; and be willing to take on more responsibilities.

You build a stronger team by developing the people who work for you. On an individual level, your employees learn more, can do more, and are more ready for promotions and/or increased responsibilities. This helps them, the team, and the organization.

You help yourself and your own career. When you delegate, you become known within the organization as a good manager who develops people. When you achieve success by developing your people, it shows anyone watching how good you are. Whether it's management, other teams, or individuals, people will take note and will want to work for you, knowing you create an environment that will help them prepare to move upward. And higher levels of management may decide you are more ready to move up, too.

Of course, there are dangers and drawbacks to delegation. Nothing is perfect. The biggest danger is that the delegated task won't get accomplished successfully. If you delegate a task to the wrong person, don't give the necessary resources and tools, or don't communicate the task and goal sufficiently, you may find yourself having to explain why the job didn't get done. It can also hurt the employee's career—as well as yours—if this happens.

How to Delegate

Before you delegate a task, you have to understand it and know what result(s) you want to see. You have to know how long it should take. You have to know what tools and resources are required. And finally, you have to be able to communicate all of this information to the employee. You might even need to provide training or guidance on how to do the task.

Pick a subordinate whom you see as motivated to take on the responsibility and capable of accomplishing the task—though as long as the person is motivated, you can teach him what he needs to know. Choosing someone who isn't motivated, even if he has the skills, is a big mistake. You run into the danger not having the task accomplished successfully and on time.

Talk to the person. Communicate the task and ensure that she understands the task, the schedule, the resources available, and the required result(s); and knows the consequences of not completing the task and the rewards for completing the task. All of this has to be clearly communicated. Ask questions. Make sure that she understands. Get her to explain it all back to you.

Follow up occasionally, particularly if it is a lengthy task. Find out if the resources were actually what were needed and if they truly have been, and continue to be, available. Inquire about any barriers, obstacles, or complications that might have arisen—people, technology, organizational restrictions or policies, lack of knowledge, or anything else. If there are barriers, help remove or break them down. Don't let something that you could have helped with be the cause of the employee's failure.

Encourage the employee. Let him know you have confidence in him. Make sure you continue to give feedback and encouragement.

But what if the person isn't progressing on the task? What options do you have to make it successful? Talk to her and find out if you need to provide additional training, tools, time, or people to assist. If so, do it (along with that continuing encouragement).

If the employee doesn't seem suited for the task, what do you do? Again, openly and honestly talk to the person. Does he want to continue? Can he get the job done? If either you or

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>
> **Theodore Roosevelt**

the employee should decide he can't do it, assign the task to another person or take it over yourself. That is a last resort, though, and must be done in such a way that it doesn't damage the employee's confidence and morale. If he is a good employee (and he must be or you wouldn't have delegated the task to him), you don't want to lose or discourage him. Explain why you are relieving him and also that it won't affect his performance appraisal. Also explain that it may (or may not, depending) affect his opportunity for other tasks. Be honest about it.

When the task is complete, recognize and reward the person. If you told her that there would be a reward, follow up and make sure that it happens. Even if there is no tangible reward, the least that it deserves is a "thank you" for the work. This will enhance the employee's motivation and authority for future assignments. It also provides an important message to others that successful completion of tasks is acknowledged and rewarded. False or broken promises lead to discontent, and that usually hurts you.

Delegation Don'ts

One very typical delegation error is to delegate work but not assign the authority to make and implement decisions. That creates frustration because the employee knows what needs to be done and how to do it—but he or she can't get it done.

It is up to you, as the manager, to make clear to everyone involved or affected by the delegated task exactly who has the authority to do what is necessary to complete the work. Under some circumstances, you may have to direct other employees to subordinate themselves to the person assigned the task for any work associated with it. It is a good idea to check periodically to find out if anyone is getting in the way or not contributing.

Don't delegate only when you are overworked or in a crisis mode. That sends the wrong message to subordinates. It says that you only delegate only when it benefits you, not to help develop them. Delegation should benefit both you and the employee. You need to delegate tasks that develop or stretch your people's talents, skills and experience. Developing workers builds up a pool of talent for your office and for the organization.

Delegate fairly. If you have multiple people who have the capability, give each a chance. Even if you have someone in whom you may not have full confidence, you may want to give him or her a shot. Start with something small and build on it. If it reaches a point where the employee can no longer succeed, you have helped him progress some and you've learned something about his capabilities.

Another part of delegating fairly is to delegate both the pleasant and unpleasant tasks. The same goes for the challenging and the boring tasks. Spread them around. Don't give all of the unpleasant assignments to the good worker just because you know she will do a good job. After too many of the unpleasant tasks, the good worker may no longer be a good worker—she may lose her motivation or decide to leave.

Micromanaging an employee to whom you have delegated a task can also ruin the motivation. Give the person some room and flexibility to do the job. Check up periodically, of course, but don't hang over his shoulder. If you have communicated well enough what you want done, give him the chance to do it. As Theodore Roosevelt put it, "The best executive is the one who has sense enough to pick good men to do what he wants done, and self-restraint enough to keep from meddling with them while they do it." Focus on the results, not necessarily the method. If it was a new and successful way to get the task accomplished, spread the word and give credit. If it wasn't good, use it as a discussion point and a learning experience.

It's About Empowerment

Delegation is a way of empowering your people. Empowerment of employees and delegation are closely intertwined. Delegation, carried out thoughtfully and carefully, is one of those win-win-win situations. It sets everyone up for success. Delegation can do a lot for the employee, you, and the organization. Do it properly and you ease your burden, motivate your employees, and get the tasks done all at once. What could be better?

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It's About Time

Christopher R. Paparone

Time is an important resource in decision making, especially under conditions of greater global interconnectedness of events, the increased ambiguity associated with them, and the uncertainty of the post-Sept. 11, 2001, environment. Indeed, time has been a critical resource in planning and operations in all peacetime and wartime experiences, but we tend to pay particular attention to time

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in situations when our foe or competitor can dictate the timing of events. Of course, we would rather have time on our side!

This article proposes that those in the defense community have a wider comprehension of time than just clocks and calendars offer. Defense professionals have multiple conceptions of time—all being uniquely useful. Those who serve in or for the military are socialized into other interpretations of time that make their professional culture quite distinctive from that of other institutions. What follows describes these different perceptions of time: event time, time as trust, and time as symbolism.

Event Time
What some may not understand is that military campaigners do not often plan operations based on calendar or clock time; rather, they make plans based on event-time orientations, where conditions, not clocks, dictate whether to start a new phase of operations. There are some who perceive that military operations are unfolding "behind schedule," but that is a misleading perception when viewing operations from an event-time perspective.

Based on degrees of uncertainty and environmental complexity, there are two forms of event time. One is based on planning with a contingent view of time based on expected outcomes of our decisions and actions, called conditional time. In that situation, we know conditions can be shaped relatively soon, but are uncertain exactly, by clock or calendar, when those conditions will exist. Nevertheless, we anticipate what actions we will execute when those conditions prevail. Defense planners are responsible for analyzing such conditions and predicting what should happen when/if they occur.

The second kind of event time is orientation time, when planners can somewhat orient toward a vision of the future but are uncertain about the complexities of achieving that vision—which, by the way, may have to change over time. Naval forces are adept at understanding this sense of time because they are often sent on deployments without a clear understanding of when and what they might have to do as they float around their assigned region. The exact time it takes to orient forces may vary, and changes to the plan can increase the time; however, the end result of the mission should always be the same: support the full range of military operations.

Applying the analogy to managing defense resources, defense professionals may have to reconsider the usefulness of calendar and conditional time orientations associated with the planning, programming, budgeting, and execution, or PPBE, process. For example, too much specificity beyond the future-years defense plan (what the planning stage of PPBE addresses) may be counterproductive and stifle innovation.

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In more uncertain times, visions of the future are important, but the more complex the environment, the more purposefully ambiguous those stated visions should be as to orient in a general direction without being overly prescriptive.

Time as Trust

A critical factor in trustworthiness is time available to build relationships. Trust among peers has been a traditional value of the defense professional. The adage of "trust your buddy to protect your flank" serves holds true for many activities beyond conditions of combat. However, this social view of time is changing with increasing globalization and complexity of defense functions, and with the growing use of ad hoc teams formed as novel situations unfold. The adage may soon become "trust a stranger" because of the growing likelihood of never having met the fellow soldier, sailor, Marine, airman, or deployed civilian who now partially controls the warfighter's destiny. Initial or swift trust of others becomes an important issue in the practice of management and organization development.

Work requirements that result from crises or some other time-critical need often result in stranger-based or swift-trust relationships in temporary teams or organizations. The need for swift trust applies to presidential commissions, Senate committees, construction contractors, film crews, theatrical companies, and certainly to defense and inter-agency ad hoc teams and task forces. For example, when state and local disaster relief activities are formulated on the fly, responders must often work together for the first time. Swift trust depends on a litany of variables that include reputation, conversation, health, safety, investments, hierarchical position, perceptions of adaptability, cognitive illusion of mastery, presumptions of trustworthiness, prospect of future interaction, and role clarity.

Time, as a dimension of trust, increases in importance as vulnerability (i.e., potential to harm) increases. With growing diversity in the workplace associated with gender, ethnic, race, and other cultures, the proposition grows that the healthy presence of trust contrasts sharply with betrayals of trust manifested through discrimination, indiscretion, unreliability, cheating, abuse, neglect, self-esteem, poor coordination, and poor anticipation. Time for team building, diversity training, and informal human relations activities takes on a whole new importance when taken in the context of building trustworthiness. Leaders should invest in social time during periods of relative calm to increase the chances for swift trust when a crisis or other short-fuse requirement hits.

Time as Symbolism

Members of the DoD community are keenly aware of symbolic rites that mark time, such as bugle calls, flag raisings and retreats, promotions, changes of command, and so on. Across the United States, not just those in DoD, bow their heads in anniversary of the "eleventh hour of the eleventh day of the eleventh month" and on every Sept. 11— numbers

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that represent time beyond the clock or a calendar date. Here clock and calendar time are subordinated to ceremonial senses—and that is an important part of DoD, be you serving or supporting.

Take the Army green "semi-dress" uniform jacket as an example of symbolic time. The jacket itself represents multiple time orientations. The jacket has brass buttons with the obverse side of Great Seal of the United States located on the four pockets and the front. The seal was designed in 1782 and symbolizes the founding of the nation. A shield on the American bald eagle breast has 13 vertical stripes symbolizing defense dating back in time to the original colonies. In the eagle's right talon is an olive branch, and in its left a bundle of 13 arrows, demonstrating we operate in times of peace and war.

On the left sleeve of the Army uniform, the unit patch is sewn, signifying the member is assigned to that unit in present time. A patch sewn on the right sleeve is a symbol of past time—back to the unit to which the member was assigned or attached in combat. Both unit patches also serve as a reminder of unit history. For example, the "AA" (All American) patch of the 82nd Airborne Division was developed in World War I to symbolize the first Army division to be formed from soldiers from all over the United States, changing the previous paradigm of forming units from each state. Other Service uniforms have similar symbolic significance toward time.

Well, timing is everything, to include knowing when to stop writing an article. It is interesting that as you read this article, you are thinking in time with me, even though I wrote this article a while ago. Here again, neither the clock nor calendar are important in the sense of time because these ideas that I thought I typed up in the past may be freshly recognized today. I hope it was time well spent for you to read this article.

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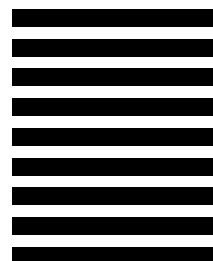
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Online encyclopedia that provides the acquisition workforce with quick access to information on common acquisition topics.

Acquisition Central
http://acquisition.gov
Shared systems and tools to support the federal acquisition community and business partners.

Acquisition Community Connection
http://acc.dau.mil
Policies, procedures, tools, references, publications, Web links, and lessons learned for risk management, contracting, system engineering, TOC.

Aging Systems Sustainment and Enabling Technologies
http://asset.okstate.edu
Government-academic-industry partnership. ASSET program-developed technologies and processes expand the DoD supply base, reduce time and cost of parts procurement, enhance military readiness.

Air Force (Acquisition)
www.safaq.hq.af.mil
Policy; career development and training opportunities; reducing TOC; library; links.

Air Force Institute of Technology
www.afit.edu
Graduate degree programs and certificates in engineering and management; Civilian Institution; Center for Systems Engineering; Centers of Excellence; distance learning.

Air Force Materiel Command Contracting Laboratory's FAR Site
http://farsite.hill.af.mil
FAR search tool; *Commerce Business Daily* announcements (CBDNet); *Federal Register*; electronic forms library.

Army Acquisition Support Center
http://asc.army.mil
News; policy; *Army AL&T* Magazine; programs; career information; events; training opportunities.

Army Training Requirements and Resources System
https://www.atrrs.army.mil
Army system of record for managing training requirements.

Assistant Secretary of the Army (Acquisition, Logistics & Technology)
https://www.alt.army.mil
ACAT Listing; ASA(ALT) Bulletin; digital documents library; links to other Army acquisition sites.

Association for the Advancement of Cost Engineering International
www.aacei.org
Planning and management of cost and schedules; online technical library; bookstore; technical development; distance learning.

Association of Old Crows
https://www.myaoc.org
News; conventions, courses; *Journal of Electronic Defense*.

Association of Procurement Technical Assistance Centers
www.aptac-us.org
PTACs nationwide assist businesses with government contracting issues.

AT&L Knowledge Sharing System
http://akss.dau.mil
Automated acquisition reference tool covering mandatory and discretionary practices.

Best Practices Clearinghouse
https://bpch.dau.mil
The authoritative source for acquisition best practices in DoD and industry. Connects communities of practice, centers of excellence, academic and industry sources, and practitioners.

Central Contractor Registry
http://www.ccr.gov
Registration for businesses wishing to do business with the federal government under a FAR-based contract.

Committee for Purchase from People Who are Blind or Severely Disabled
www.abilityone.gov
Information and guidance to federal customers on the requirements of the Javits-Wagner-O'Day (JWOD) Act.

Defense Acquisition University and Defense Systems Management College
www.dau.mil
DAU Course Catalog; *Defense AT&L* magazine and *Defense Acquisition Review Journal*; DAU/DSMC course schedules; educational resources.

DAU Alumni Association
www.dauaa.org
Acquisition tools and resources; links; career opportunities; member forums.

Defense Advanced Research Projects Agency
www.darpa.mil
News releases; current solicitations; *Doing Business with DARPA*.

Defense Information Systems Agency
www.disa.mil
Defense Information System Network; Defense Message System; Global Command and Control System.

Defense Modeling and Simulation Coordination Office
http://www.msco.mil
DoD modeling and simulation master plan; document library; events; services.

Defense Spectrum Organization
http://www.disa.mil/dso/
Operational spectrum management support to the Joint Staff and COCOMs; conducts R&D into spectrum-efficient technologies.

Defense Technical Information Center
www.dtic.mil
DTIC's scientific and technical information network (STINET) is one of DoD's largest available repositories of scientific, research, and engineering information. Hosts over 100 DoD Web sites.

Department of Commerce, Defense Priorities and Allocations System
www.bis.doc.gov/dpas
DPAS regulation, policies, procedures, and training resources.

Deputy Chief Management Officer
http://www.defenselink.mil/dcmo/index.html
Information on the Defense Business Transformation Agency and the DoD Performance Improvement Officer.

Deputy Under Secretary of Defense for Acquisition, Technology and Logistics
www.acq.osd.mil/at
Acquisition and technology organization, goals, initiatives, and upcoming events.

Director, Defense Procurement and Acquisition Policy
www.acq.osd.mil/dpap
Procurement and acquisition policy news and events; reference library; acquisition education and training policy, guidance.

DoD Defense Standardization Program
www.dsp.dla.mil
DoD standardization; points of contact; FAQs; military specifications and standards; newsletters; training; nongovernment standards; links.

DoD Enterprise Software Initiative
www.esi.mil
Joint project to implement true software enterprise management process within DoD.

DoD Inspector General Publications
http://www.dodig.mil/PUBS/index.html
Audit and evaluation reports; IG testimony; planned and ongoing audit projects of interest to the AT&L community.

DoD Office of Technology Transition
www.acq.osd.mil/ott
Information about and links to OTT's programs.

DoD Systems Engineering
http://www.acq.osd.mil/sse
Policies, guides and information on SE and related topics, including developmental T&E and acquisition program support.

Earned Value Management
www.acq.osd.mil/pm
Implementation of EVM; latest policy changes; standards; international developments.

Electronic Industries Alliance
www.eia.org
Government relations department; links to issues councils; market research assistance.

FAIR Institute
http://www.thefairinstitute.org
Organization that promotes a federal acquisition system that continually innovates, exceeds world class standards of performance, and ensures the prudent use of taxpayer dollars.

Federal Acquisition Institute
www.fai.gov
Virtual campus for learning opportunities; information access and performance support.

Federal Acquisition Jumpstation
http://prod.nais.nasa.gov/pub/fedproc/home.html
Procurement and acquisition servers by contracting activity; CBDNet; reference library.

Federal Aviation Administration
http://fast.faa.gov
Online policy and guidance for all aspects of the acquisition process.

Federal Business Opportunities
www.fedbizopps.gov
Single government point-of-entry for federal government procurement opportunities over $25,000.

Federal R&D Project Summaries
http://www.osti.gov/fedrnd
Portal to information on federal research projects; search databases at different agencies.

Acquisition & Logistics Excellence

An Internet Listing Tailored to the Professional Acquisition Workforce

Surfing the Net

Federal Research in Progress Database
http://grc.ntis.gov/fedrip.htm
Information on federally funded projects in the physical sciences, engineering, life sciences.

Fedworld Information
www.fedworld.gov
Central access point for searching, locating, ordering, and acquiring government and business information.

Government Accountability Office
http://gao.gov
GAO reports;policy and guidance; FAQs.

General Services Administration
www.gsa.gov
Online shopping for commercial items to support government interests.

Government-Industry Data Exchange Program
http://www.gidep.org
Federally funded co-op of government-industry participants, providing electronic forum to exchange technical information essential to life cycle development.

GOV.Research_Center
http://grc.ntis.gov
U.S. Dept. of Commerce, National Technical Information Service, and National Information Services Corporation joint venture, single-point access to government information.

Integrated Dual-Use Commercial Companies
www.idcc.org
Information for technology-rich commercial companies on doing business with the federal government.

International Society of Logistics
www.sole.org
Online desk references that link to logistics problem-solving advice; Certified Professional Logistician certification.

International Test & Evaluation Association
www.itea.org
Professional association to further development and application of T&E policy and techniques to assess effectiveness, reliability, and safety of new and existing systems and products.

Joint Capability Technology Demonstrations
www.acq.osd.mil/jctd
JCTD's accomplishments, articles, speeches, guidelines, and POCs.

Joint Interoperability Test Command
http://jitc.fhu.disa.mil
Policies and procedures for interoperability certification; lessons learned; support.

Library of Congress
www.loc.gov
Research services; Copyright Office; FAQs.

MANPRINT (Manpower and Personnel Integration)
www.manprint.army.mil
Points of contact for program managers; relevant regulations; policy letters from the Army Acquisition Executive; briefings on the MANPRINT program.

NASA's Commercial Technology Office
http://technology.grc.nasa.gov
Promotes competitiveness of U.S. industry through commercial use of NASA technologies and expertise.

National Contract Management Association
www.ncmahq.org
Educational products catalog; publications; career center.

National Defense Industrial Association
www.ndia.org
Association news; events; government policy; *National Defense* magazine.

National Geospatial-Intelligence Agency
www.nima.mil
Imagery; maps and geodata; Freedom of Information Act resources; publications.

National Institute of Standards and Technology
http://www.nist.gov
Information about NIST technology, measurements, and standards programs, products, and services.

National Technical Information Service
www.ntis.gov
Online service for purchasing technical reports, computer products, videotapes, audiocassettes.

Naval Air Systems Command
www.navair.navy.mil
Provides advanced warfare technology through the efforts of a seamless, integrated, worldwide network of aviation technology experts.

Naval Sea Systems Command
www.navsea.navy.mil
TOC; documentation and policy; reduction plan; implementation timeline; TOC reporting templates; FAQs.

Navy Best Manufacturing Practices Center of Excellence
www.bmpcoe.org
National resource to identify and share best manufacturing and business practices in use throughout industry, government, academia.

Navy Research, Development, and Acquisition
http://acquisition.navy.mil/rda
Policy documents; career management; Acquisition One Source page, providing links to acquisition communities of practice.

Office of Naval Research
http://www.onr.navy.mil/
News and announcements; publications and regulations; technical reports; doing business with the Navy.

Open Systems Joint Task Force
www.acq.osd.mil/osjtf
Open systems education and training opportunities; studies and assessments; projects, initiatives and plans; library.

Parts Standardization and Management Committee
www.dscc.dla.mil/programs/psmc
Collaborative effort between government and industry for parts management and standardization through commonality of parts and processes.

Performance-Based Logistics Toolkit
https://acc.dau.mil/pbltoolkit
Web-based 12-step process model for development, implementation, and management of PBL strategies.

Project Management Institute
http://www.pmi.org
Program management publications; information resources; professional practices; career certification.

Small Business Administration
www.sba.gov
Communications network for small businesses.

DoD Office of Small Business Programs
www.acq.osd.mil/osbp
Program and process information; current solicitations; Help Desk information.

Software Engineering Institute (SEI)
www.sei.cmu.edu
Advances software engineering principles and practices as well as computer security, and process improvements.

Software Program Managers Network
www.spmn.com
Supports project managers, software practitioners, and government contractors. Contains publications on highly effective software development best practices.

Space and Naval Warfare Systems Command
https://e-commerce.spawar.navy.mil
SPAWAR business opportunities; acquisition news; solicitations; small business information.

System of Systems Engineering Center of Excellence
www.sosece.org
Advances the development, evolution, practice, and application of the system of systems engineering discipline across individual and enterprise-wide systems.

Under Secretary of Defense for Acquisition, Technology and Logistics
www.acq.osd.mil
USD(AT&L) documents; streaming videos; links.

U.S. Coast Guard
www.uscg.mil
News and current events; services; points of contact; FAQs.

U.S. Department of Transportation Maritime Administration
www.marad.dot.gov
Information and guidance on the requirements for shipping cargo on U.S. flag vessels.

Defense AT&L Writer's Guidelines in Brief

Purpose
Defense AT&L is a bi-monthly magazine published by DAU Press, Defense Acquisition University, for senior military personnel, civilians, defense contractors, and defense industry professionals in program management and the acquisition, technology, and logistics workforce. The magazine provides information on policies, trends, events, and current thinking regarding program management and the acquisition, technology, and logistics workforce.

Submission Procedures
Submit articles by e-mail to datl(at)dau.mil or on disk to: DAU Press, ATTN: Carol Scheina, 9820 Belvoir Rd., Suite 3, Fort Belvoir VA 22060-5565. Submissions must include the author's name, mailing address, office phone number, e-mail address, and fax number.

Receipt of your submission will be acknowledged in five working days. You will be notified of our publication decision in two to three weeks.

Deadlines

Issue	Author Deadline
January-February	1 October
March-April	1 December
May-June	1 February
July-August	1 April
September-October	1 June
November-December	1 August

If the magazine fills before the author deadline, submissions are considered for the following issue.

Audience
Defense AT&L readers are mainly acquisition professionals serving in career positions covered by the Defense Acquisition Workforce Improvement Act (DAWIA) or industry equivalent.

Style
Defense AT&L prints feature stories focusing on real people and events. The magazine also seeks articles that reflect your experiences and observations rather than pages of researched information.

The magazine does not print academic papers; fact sheets; technical papers; white papers; or articles with footnotes, endnotes, or references. Manuscripts meeting any of those criteria are more suited to DAU's journal, *Acquisition Review Journal (ARJ)*.

Defense AT&L does not reprint from other publications. Please do not submit manuscripts that have appeared in print elsewhere. *Defense AT&L* does not publish endorsements of products for sale.

Length
Articles should be 1,500 – 2,500 words.

Format
Submissions should be sent via e-mail as a Microsoft® Word attachment.

Graphics
Do not embed photographs or charts in the manuscript. Digital files of photos or graphics should be sent as e-mail attachments or mailed on CDs (see address above). Each figure or chart must be saved as a separate file in the original software format in which it was created.

TIF or JPEG files must have a resolution of 300 pixels per inch; enhanced resolutions are not acceptable; images downloaded from the Web are not of adequate quality for reproduction. Detailed tables and charts are not accepted for publication because they will be illegible when reduced to fit at most one-third of a magazine page.

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Author Information
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